46th Annual Targets, UAVs & Range Operations Symposium & Exhibition

"Test Like You Train…..Train Like You Fight"

San Antonio, Texas

8-10 October 2008

Agenda

Thursday, October 9, 2008

KEYNOTE ADDRESS

- Mr. Michael Crisp, Deputy Director, Air Warfare, DOT&E

SESSION I: RANGES AND RANGE OPERATIONS:

- **Integrated Network Telemetry (iNET):** Mr. Thomas Grace, Chief Engineer, Test Article, ATL-TRMC, Naval Air Warfare Center
- **Gulf Range Drone Control System (GRDCS): Past, Present, Future:** Mrs. Sandra Brown, 46 VTS Specialized Engineering Flight Commander, 46 RANG/VTSO
- **Combat Hammer:** Lt Col Dean Ostovich, USAF, 86 Fighter Weapon Squadron/CC, Eglin AFB, FL
- **Common Range Integrated Instrumentation System (CRIIS):** Mr. Mike Sorial, Director, 672nd Armament Systems Squadron
- **Combined Aerial Target Service (CATS) – Long Term Service Provision:** Mr. John Childs, Aerial Targets Business Development, QinetiQ Ltd.
- **Surface Target Vector Scorer for Enhanced Fleet Training Capabilities:** Mr. Rob Couture, Director, Electronic Systems, Meggitt Defense Systems, Inc.

SESSION II: NEW TECHNOLOGY

- **Application of Unmanned Vehicles in Border Security:** Maj Gen Michael C. Kostelnik, USAF (Ret), Assistant Commissioner, Office of CBP Air and Marine, U.S.Customs and Border Protection
- **Cost of Readiness Earned from Range Use:** Mr. Steve Shegrud, Whitney, Bradley & Brown, Inc.
- **Hugh Harris Scholarship Update:** Mr. Cort Proctor, Consultant, Micro Systems, Inc.

Friday, October 10, 2008

KEYNOTE ADDRESS

- Maj Gen David Eichhorn, USAF, Commander, Air Force Flight Test, Center, Edwards AFB, CA

SESSION III: CURRENT TRENDS

- **BQM-167A: Air Force Subscale Aerial Target (AFSAT) Update; THE FIRE JET:** Mr. Jeff Herro, VP of Business Development, Composite Engineering, Inc.
- **Micro UAVs:** Mr. Steve Bishop, Program Manager, Air Force Special Operations Command, Unmanned Systems Technology Office
- **F-35 Training Requirements:** Maj Lee "Vandal" Kloos, USAF, F-35 Deputy for Flying Training Beddown, AETC F-35 Program Integration Office, Eglin AFB, FL
- **Telemetry Solutions for Targets and UAVs:** Mr. John Watson, Director, New Product Development, Dynetics Corp.

SESSION IV: MILITARY PROGRAMS AND REQUIREMENTS

- **U.S. Navy:** CAPT Pat Buckley, USN, Program Manager, Aerial Target and Decoy Systems, PMA-208, Patuxent River, MD
- **U.S. Army:** Mr. Alvin Brown, Director, Targets Management Office, Redstone Arsenal, Huntsville, AL
- **U.S. Air Force:** Ms. Michele Brazel, Director, 691st Armament Systems Squadron, Eglin AFB, FL

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46th ANNUAL TARGETS, UAVS & RANGE OPERATIONS SYMPOSIUM & EXHIBITION

SUPPORTING THE WARFIGHTER IN TIMES OF CHANGE

"Test Like You Train . . . Train Like You Fight"

ONSITE AGENDA

Symposium Highlights:

- Keynote Address by Mr. Michael Crisp, Deputy Director, Air Warfare, DOT&E
- Keynote Address by Maj Gen David Eichhorn, USAF, Commander, Air Force Flight Test Center, Edwards AFB, CA
- Hugh Harris Memorial Golf Tournament on Wednesday, October 8, 2008
- Willis Howard Award Presentation on Thursday, October 9, 2008

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OCTOBER 8-10, 2008
WWW.NDIA.ORG/MEETINGS/9410

EVENT #9410

WEDNESDAY, OCTOBER 8, 2008

10:00 AM	**Hugh Harris Memorial Golf Tournament** ▸ Mr. Bob Palmer, Meggit Defense Systems, Inc., Canada; Golf Tournament Director
1:00 PM - 6:30 PM	**Registration Open**
5:00 PM - 6:30 PM	**Welcome Reception in Exhibit Hall**

THURSDAY, OCTOBER 9, 2008

7:00 AM - 8:00 AM	**Continental Breakfast in Exhibit Hall; Registration Open**
8:00 AM - 8:10 AM	**Welcome Remarks and Keynote Speaker Introduction** ▸ Mr. David Laird, Director of Programs, Micro Systems, Inc.; Symposium Chairman
8:10 AM - 8:50 AM	**Keynote Address** ▸ Mr. Michael Crisp, Deputy Director, Air Warfare, DOT&E

SESSION I: RANGES AND RANGE OPERATIONS

8:50 AM - 9:00 AM	**Session Introduction** ▸ Mr. Craig Tangedal, Systems Engineer, 5D Systems
9:00 AM - 9:20 AM	**Integrated Network Telemetry (iNET)** ▸ Mr. Thomas Grace, Chief Engineer, Test Article, ATL-TRMC, Naval Air Warfare Center
9:20 AM - 9:40 AM	**Gulf Range Drone Control System (GRDCS): Past, Present, Future** ▸ Mrs. Sandra Brown, 46 VTS Specialized Engineering Flight Commander, 46 RANG/VTSO
9:40 AM - 10:05 AM	**Break in Exhibit Hall**
10:05 AM - 10:25 AM	**Combat Hammer** ▸ Lt Col Dean Ostovich, USAF, 86 Fighter Weapon Squadron/CC, Eglin AFB, FL
10:25 AM - 10:45 AM	**Common Range Integrated Instrumentation System (CRIIS)** ▸ Mr. Mike Sorial, Director, 672nd Armament Systems Squadron
10:45 AM - 11:05 AM	**Changes and Upgrades on the Sea Range** ▸ Ms. Karen Draper, Deputy, Test Management Division, Pt. Mugu
11:05 AM - 11:25 AM	**Combined Aerial Target Service (CATS) – Long Term Service Provision** ▸ Mr. John Childs, Aerial Targets Business Development, QinetiQ Ltd.
11:25 AM - 11:45 AM	**Creating Precision Target, UAV and Range RF/IF Signals for Analysis, R&D and T&E** ▸ Mr. Steve Williams, Business Area Manager, Signal Monitoring, RT Logic
11:45 AM - 12:05 PM	**Surface Target Vector Scorer for Enhanced Fleet Training Capabilities** ▸ Mr. Rob Couture, Director, Electronic Systems, Meggitt Defense Systems, Inc.
12:05 PM - 12:15 PM	**Willis Howard Award Presentation** ▸ Mr. David Miller, Business Development, Meggitt Defense Systems, Inc.; Division Chairman
12:15 PM - 1:30 PM	**Lunch in Exhibit Hall**

SESSION II: NEW TECHNOLOGY

1:30 PM - 1:40 PM	**Session Introduction** ▸ Mr. Dennis Mischel, Target Assessment Lead and Target Investment Program Manager, DOT&E
1:40 PM - 2:25 PM	**Application of Unmanned Vehicles in Border Security** ▸ Maj Gen Michael C. Kostelnik, USAF (Ret), Assistant Commissioner, Office of CBP Air and Marine, U.S. Customs and Border Protection
2:25 PM - 3:10 PM	**Cost of Readiness Earned from Range Use** ▸ Mr. Steve Shegrud, Whitney, Bradley & Brown, Inc.
3:10 PM - 3:40 PM	**Break in Exhibit Hall**
3:40 PM - 4:00 PM	**Threat Representation Investments in Support of Weapon Testing** ▸ Mr. Ken McCormick, Chief, MST, Test & Evaluation Threat Resource Activity (TETRA), Missile Space and Intelligence Center
4:00 PM - 4:10 PM	**Hugh Harris Scholarship Update** ▸ Mr. Cort Proctor, Consultant, Micro Systems, Inc.

THURSDAY KEYNOTE ADDRESS

Mr. Michael Crisp, Deputy Director, Air Warfare, DOT&E

FRIDAY KEYNOTE ADDRESS

Maj Gen David Eichhorn, USAF, Commander, Air Force Flight Test Center, Edwards AFB, CA

4:10 PM - 4:30 PM	**Super Sonic Sea Skimming Target: A Lower Cost Alternative** ▶ CDR Noel Purcell, Royal Canadian Navy, National Defence Headquarters
4:30 PM - 6:00 PM	**Reception in Exhibit Hall**

FRIDAY, OCTOBER 10, 2008

7:00 AM - 8:00 AM	**Continental Breakfast in Exhibit Hall; Registration Open**
8:00 AM - 8:15 AM	**Welcome Remarks and Keynote Speaker Introduction** ▶ Mr. David Laird, Director of Programs, Micro Systems, Inc.; Symposium Chairman
8:15 AM - 9:00 AM	**Keynote Address** ▶ Maj Gen David Eichhorn, USAF, Commander, Air Force Flight Test Center, Edwards AFB, CA

SESSION III: CURRENT TRENDS

9:00 AM - 9:10 AM	**Session Introduction** ▶ Mr. Jack Chancellor, Business Development, Meggitt Defense Systems, Inc.
9:10 AM - 9:30 AM	**Predator Operational Test & Evaluation** ▶ Capt Brian Beecher, USAF, 53rd Test Management Group/Det 4
9:30 AM - 10:00 AM	**Break in Exhibit Hall**
10:00 AM - 10:20 AM	**BQM-167A: Air Force Subscale Aerial Target (AFSAT) Update; The Fire Jet** ▶ Mr. Jeff Herro, VP of Business Development, Composite Engineering, Inc.
10:20 AM - 10:50 AM	**Micro UAVs** ▶ Mr. Steve Bishop, Program Manager, Air Force Special Operations Command, Unmanned Systems Technology Office
10:50 AM - 11:10 AM	**F-35 Training Requirements** ▶ Maj Lee “Vandal” Kloos, USAF, F-35 Deputy for Flying Training Beddown, AETC F-35 Program Integration Office, Eglin AFB, FL
11:10 AM - 11:30 AM	**Telemetry Solutions for Targets and UAVs** ▶ Mr. John Watson, Director, New Product Development, Dynetics Corp.
11:30 AM - 11:50 AM	**Program Update** ▶ Mr. Steve Moore, Project Director, Aerial Target Flight Services, PM ITTS Targets Management Office, Redstone Arsenal, AL
11:50 AM - 1:30 PM	**Lunch in Exhibit Hall (Last Chance to View Exhibits)**
1:30 PM	**Exhibit Hall Closes**

SESSION IV: MILITARY PROGRAMS AND REQUIREMENTS

1:30 PM - 1:40 PM	**Session Introduction** ▶ Mr. Ken Hislop, QF-16 Program Manager, Eglin AFB, FL
1:40 PM - 2:00 PM	**U.S. Navy** ▶ CAPT Pat Buckley, USN, Program Manager, Aerial Target and Decoy Systems, PMA-208, Patuxent River, MD
2:00 PM - 2:20 PM	**U.S. Army** ▶ Mr. Alvin Brown, Director, Targets Management Office, Redstone Arsenal, Huntsville, AL
2:20 PM - 2:40 PM	**U.S. Air Force** ▶ Ms. Michele Brazel, Director, 691st Armament Systems Squadron, Eglin AFB, FL
2:40 PM - 2:50 PM	**Concluding Remarks** ▶ Mr. David Laird, Director of Programs, Micro Systems, Inc.; Symposium Chairman

SYMPOSIUM CONTACTS

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Symposium Chairman
(850) 244-2332 x 220
dlaird@gomicrosystems.com

ATTIRE

Appropriate dress for this symposium is business casual for civilians and Class B uniform or uniform of the day for military personnel.

ID BADGES

During symposium registration and check-in, each attendee will be issued an identification badge. Please be prepared to present a valid picture ID. Badges must be worn at all symposium functions.

PROCEEDINGS

Proceedings will be available on the web through the Defense Technical Information Center (DTIC):

http://www.dtic.mil/ndia/2008targets/2008targets.html

You will receive an email notification once the proceedings are available.

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MEGGITT

Meggitt Defense Systems (MDS) is proud to sponsor the NDIA Targets Symposium. MDS is a world leading designer and producer of sub-scale free flying and towed targets with well over 140,000 targets delivered to the U.S. and allied forces over our company's history. Our products range from the 180-300 knot class Banshee and Voodoo powered targets to the 400 knot class GT-400 glide target and a wide portfolio of towed targets and highly reliable reeling machines and tow lines. Our targets can be modified with signature augmentation devices to match training threats in the visible IR and radar spectrums. MDS also designs and produces a wide variety of Acoustic and Doppler radar-based scoring systems for both scalar and vector applications along with associated ground stations for rapid feedback during engagements. We have also developed and fielded the Aerial Weapon Scoring System (AWSS) that has become the U.S. Army's standard for objective weapons evaluation during Apache crew qualification gunnery tables.

MDS' other technologies include airborne countermeasure systems, ammunition handling systems and environmental control systems. Our Training Systems group in Atlanta, Georgia specializes in live-fire range Targetry, control and instrumentation for various weapon types ranging from small arms through full tank rounds and virtual training ranges utilizing the latest in computer generated graphics for full immersion scenarios from individual weapons to full combat unit engagements, including calls for fire and air strikes.

Our company's goal is to support our armed forces with the best training and combat systems possible so the soldiers can train like they fight and fight like they train. We take pride in our combat systems' reliability from towed countermeasures to ammunition handling systems – all proven in combat in the harshest environments in the world. Our motto, "Smart engineering for extreme environments" means we take great pride that our equipment will work the first time and every time, wherever deployed.

Please visit the Meggit Defense Systems website:
www.meggittdefense.com

THANK YOU FOR ATTENDING!
WE'LL SEE YOU NEXT YEAR IN SAVANNAH, GA
NOVEMBER 10-12, 2009

AF SUAS & the future of Micro SUAS

Mr. Stephen Bishop
AFSOC Unmanned System Technologies

U.S. AIR FORCE

Approved for Public Release
AFSOC/PA Oct 08

Classification

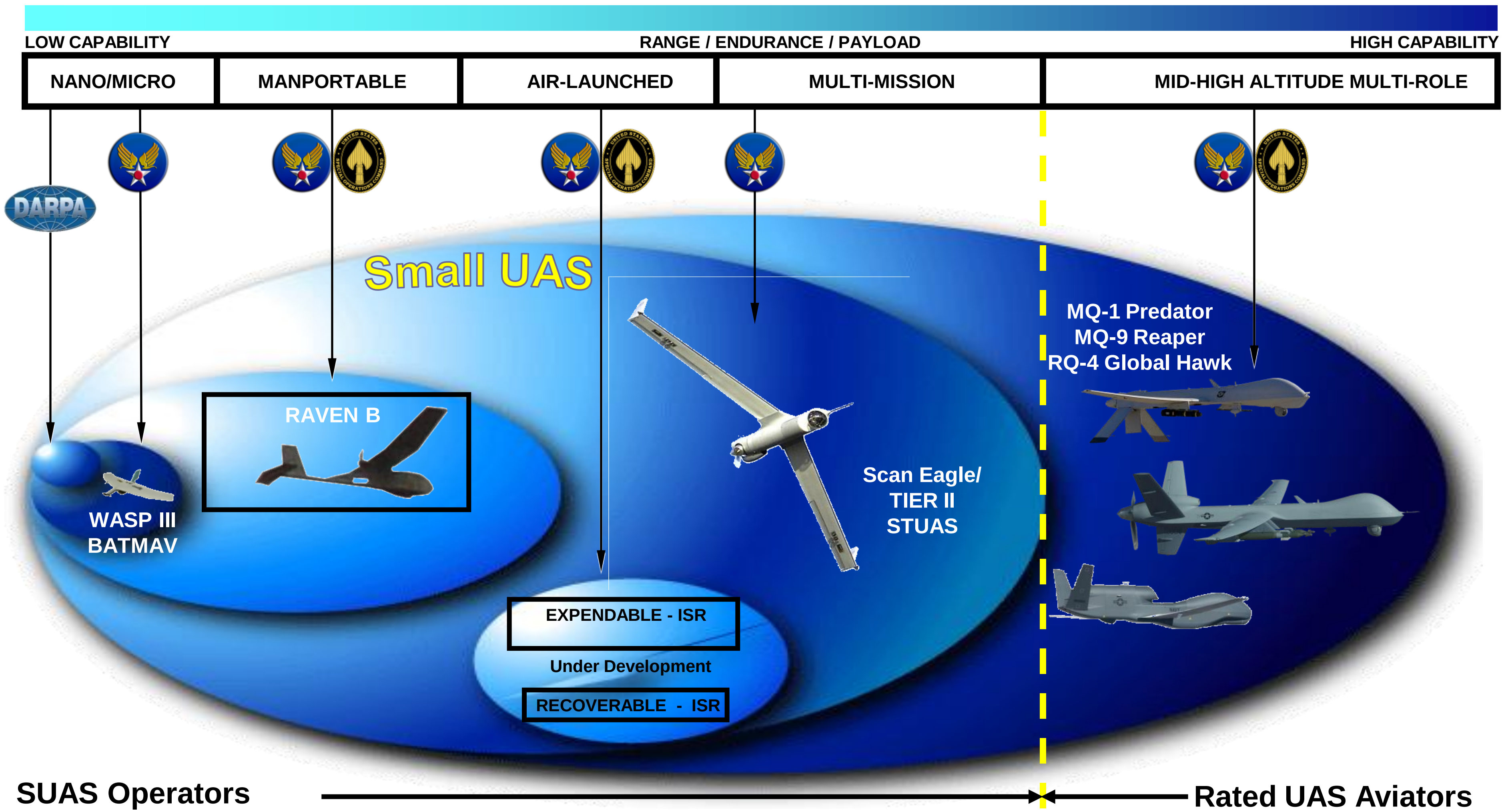
This Briefing Is: UNCLASSIFIED
Classified by:
Reason:
Declassify on:

Approved for Public Release

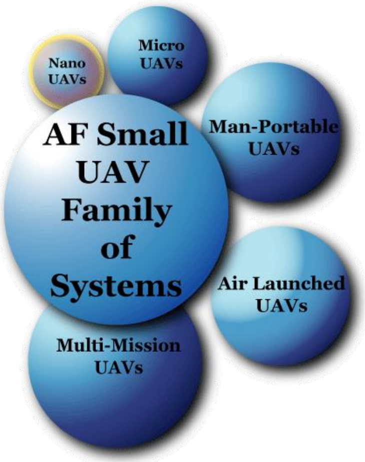
Purpose/Overview

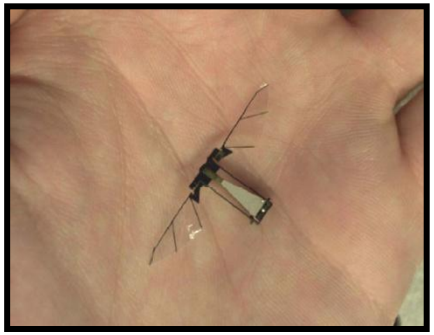
- Purpose:
  - Update on Air Force Small Unmanned Aircraft System (SUAS) Family of Systems
  - Vision of the Future – Focus for Technology
- Duration: 40 minutes

AF UAS Capabilities



Nano Category

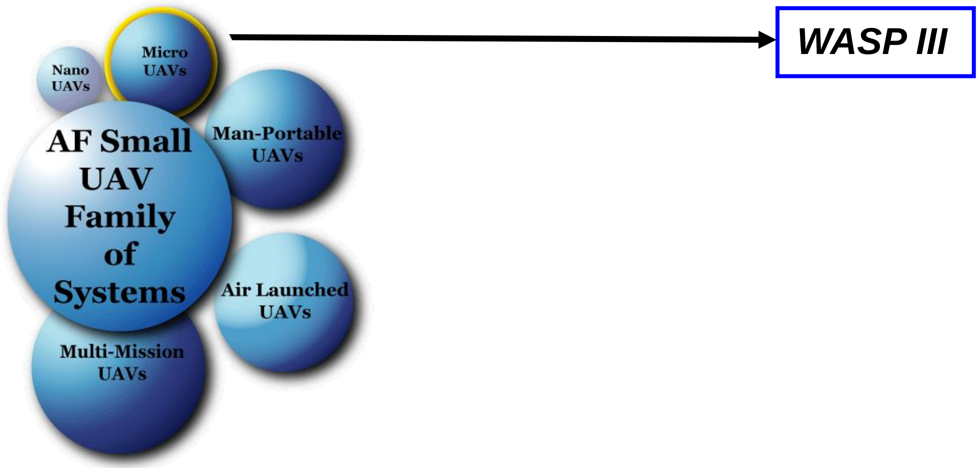




Tech Demo | Fielded | Interim | Unfunded

- **NANO:**
  - **DARPA only focus at this point**
  - **Searching for ways to navigate / communicate inside buildings**
  - **Transformers approach flying and crawling together for sensing other capabilities other than visual**

Micro Category



Wasp III

Tech Demo | Fielded | Interim | Unfunded

- Battlefield Air Targeting Micro Air Vehicle:
  - AF Program of Record
    - Fielded with AF Battlefield Airmen
    - Close-in reconnaissance and situational awareness
  - USMC, USA and SOF purchasing, Customs Border Patrol are evaluating system for their use

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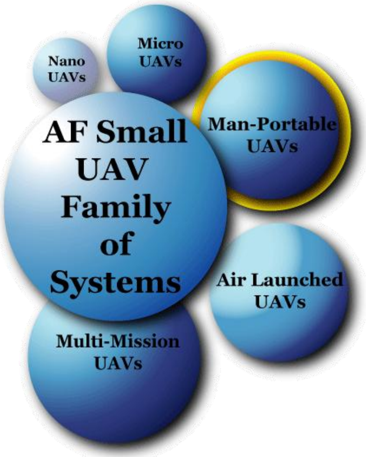
Man-Portable Category



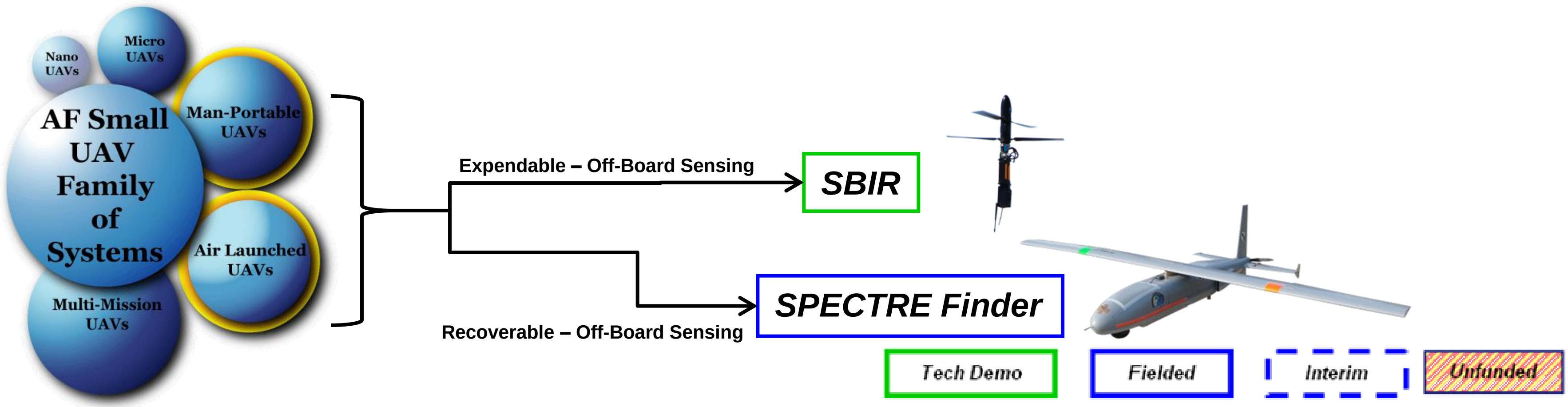
Ground-Launched RSTA → *RQ-11B (Raven B)*

Raven B

Tech Demo | *Fielded* | *Interim* | *Unfunded*

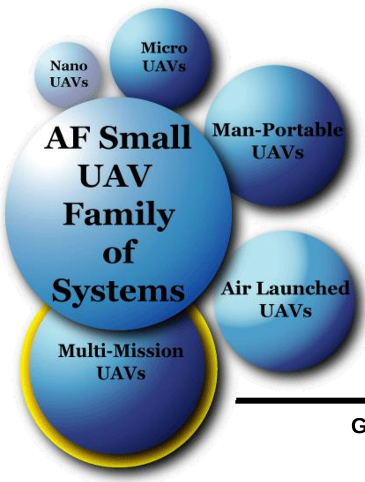
- **Service common success story:**
  - **Ground-launched RSTA – Filled by the joint service RQ-11 B (Raven B) – Army has lead over RQ-11B**
    - **AF Battlefield Airmen**
    - **AF Security Forces**
    - **TACP**

Air-Launched Category



- Two major categories
  - Expendable – Off-Board Sensing
    - Assist through the weather (WX) sensing for current and next generation gunships
  - Recoverable – Off-Board Sensing
    - Extend the ability of other unmanned systems MQ-1/9 Predator/Reaper for multiple target tracking and through the WX

Multi-Mission Category



Ground-Launched RSTA → Scan Eagle

Scan Eagle

Tech Demo | Fielded | Interim | Unfunded

- ISR Gap filler between Raven and Predator:
  - Currently filled by an interim solution for AF Security Forces
    - Ground Situational Awareness Toolkit (GSAT) – Scan Eagle
    - Purchased as a concept demonstrator by the AF UAV Battlelab
  - AF teaming with USMC and USN for a joint program of record called Tier II Small Tactical UAS (STUAS)
    - Approved by JROC on 17 Sep 08

SUAS – Key Issues #1

- SUAS Frequency Use / Allocation
  - Frequency loss in some foreign countries
  - Need digital data links for SUAS – phased approach
- SUAS National Air Space access
  - AFSOC lead command for AF / USSOCOM airspace requests
  - SUAS flights outside of Restricted Airspace requires an FAA waiver / COA

AF Security Forces set-up control antenna for Scan Eagle

Wasp II / Raven B

SUAS Key Issues #2

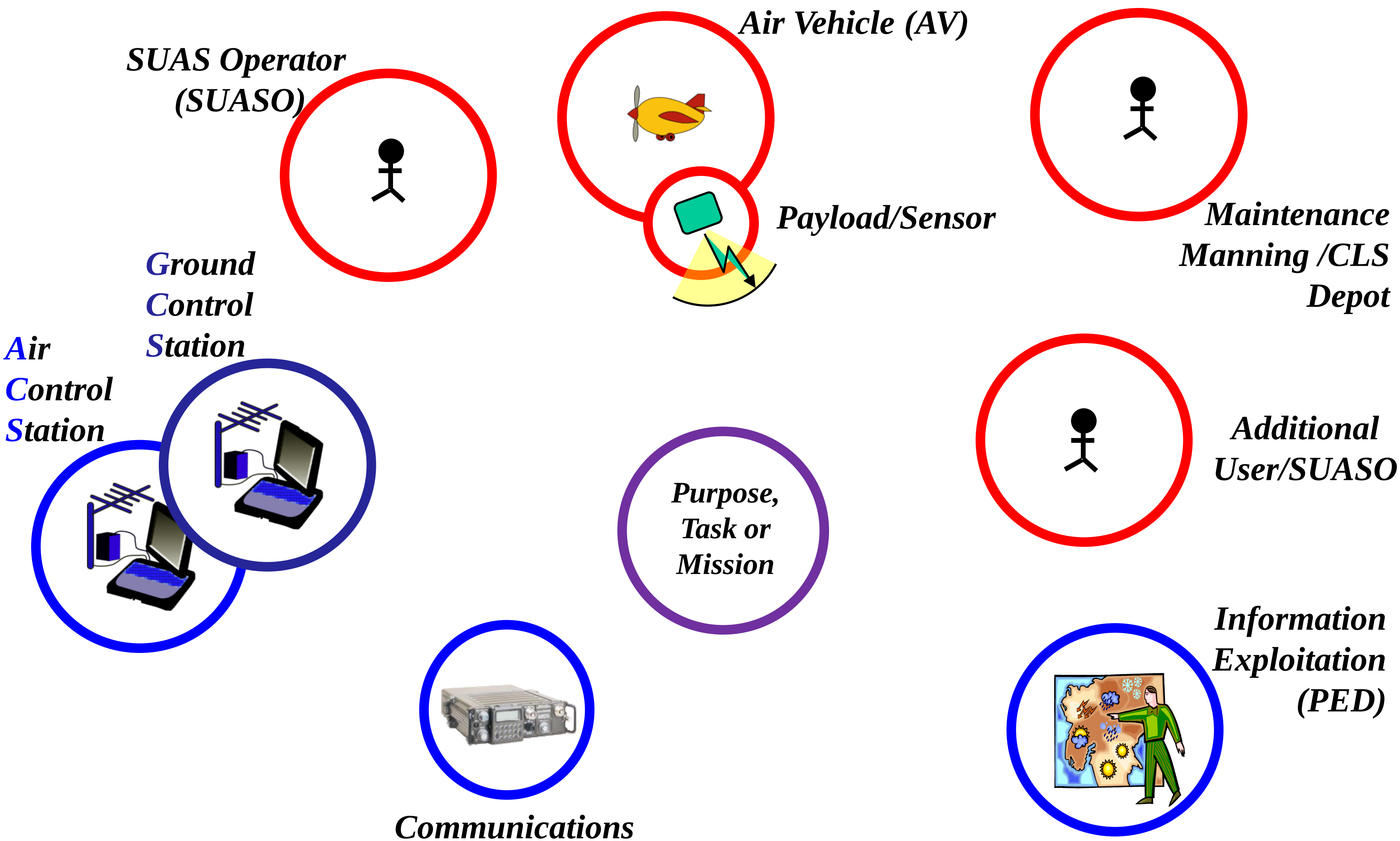
- Service cooperation on SUAS operator joint training standards and certification
  - SUAS operators already attend similar training on Wasp III, Raven B
  - Tier II presents excellent opportunity joint training
    - AF Security Forces will train under a joint Basic and Initial Qualification Training (B/IQT) course

AF Wasp III

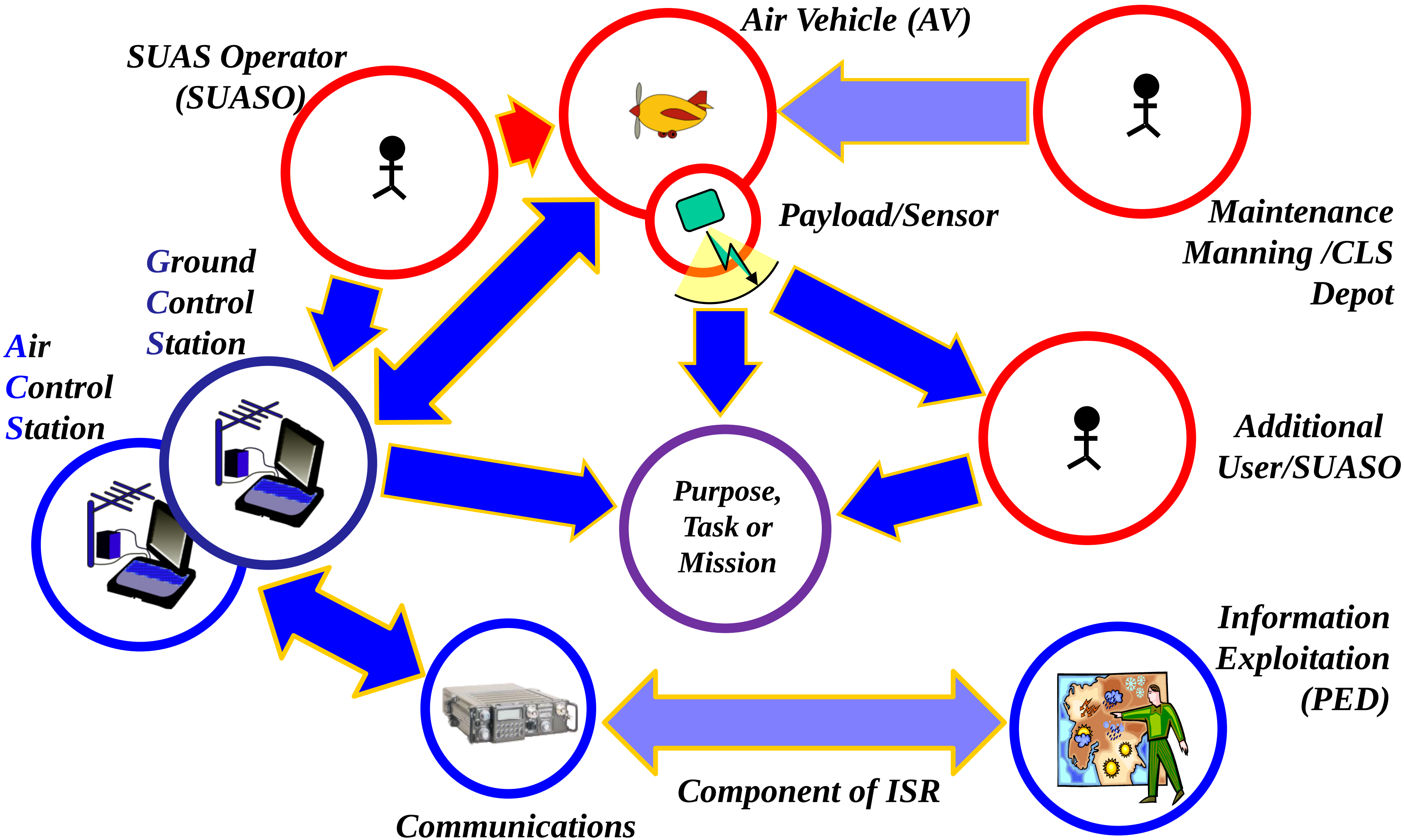
AF Raven B

AF Scan Eagle

SUAS Micro Focus – System



SUAS Micro Focus – System



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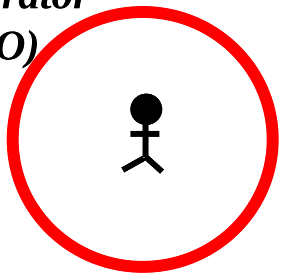
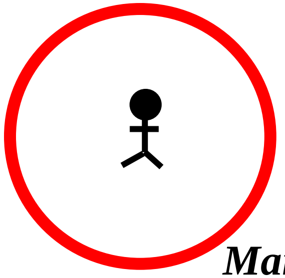
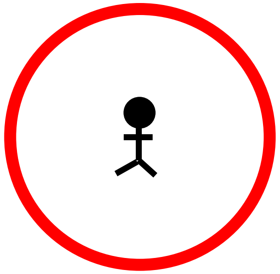
Micro: Human Machine Interface (HMI) Challenges

SUAS Operator (SUASO)





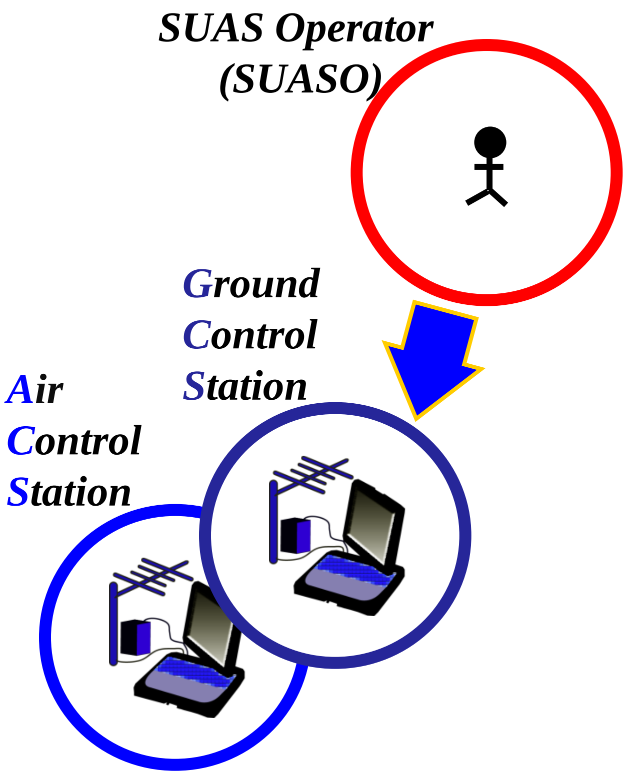
Maintenance Manning /CLS Depot



Additional User/SUASO

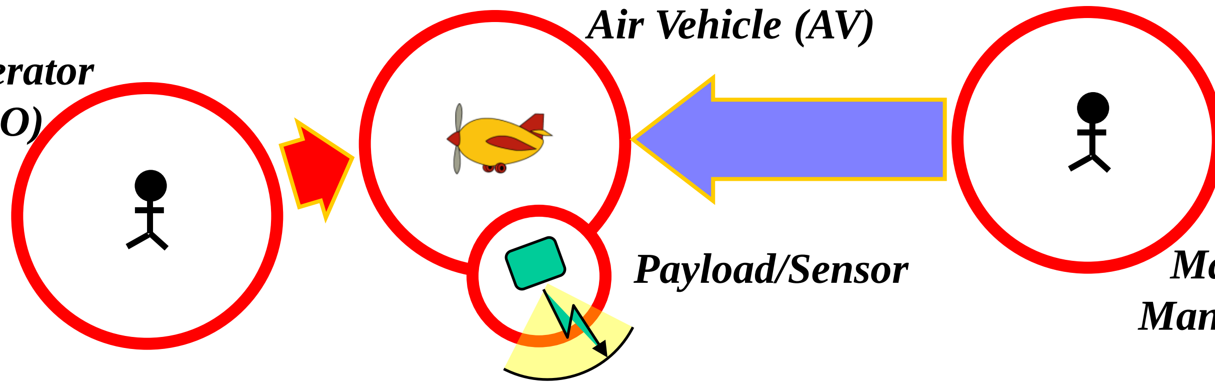
- **Training Selection**
  - **Software to ID dexterity/aptitude**
- **Training requirements - SUASO**
  - **Basic airmanship interactive training**
  - **Realistic simulation environment without flying**
  - **Error/Malfunction generation to allow practice of Eps/lost link**

Micro: HMI Challenges (Cont)



- Human – Machine Interface (HMI) – ergonomics, voice recognition
- GCS/ACS – Integrated systems
  - Digital
  - Self-healing software
  - Software versus hardware – REDUCED WEIGHT
  - Cursor-on-target
  - COT interface – non proprietary
  - Standard interfaces – USB / future with ability for legacy interface
  - Embedded training

Micro – HMI Challenges (Cont)



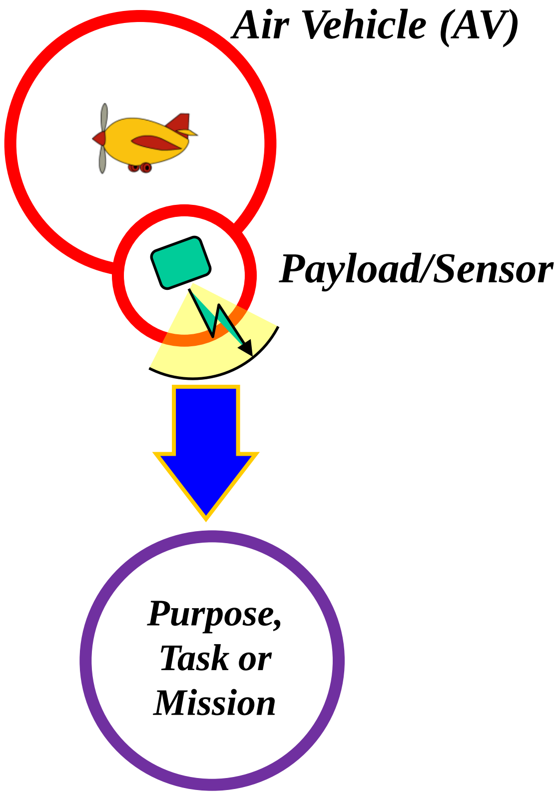
- Visual Cueing – lighting
- Acoustic cueing
  - Human / Animal
- Safety of design
- Ease of use / understanding

- Barcoding – Computer Scan
  - Ability to track all components
- Component checks – BIT
- Uploading latest upgrades
- Common language

Micro: Air Vehicle / Sensor Challenges

Air Vehicle

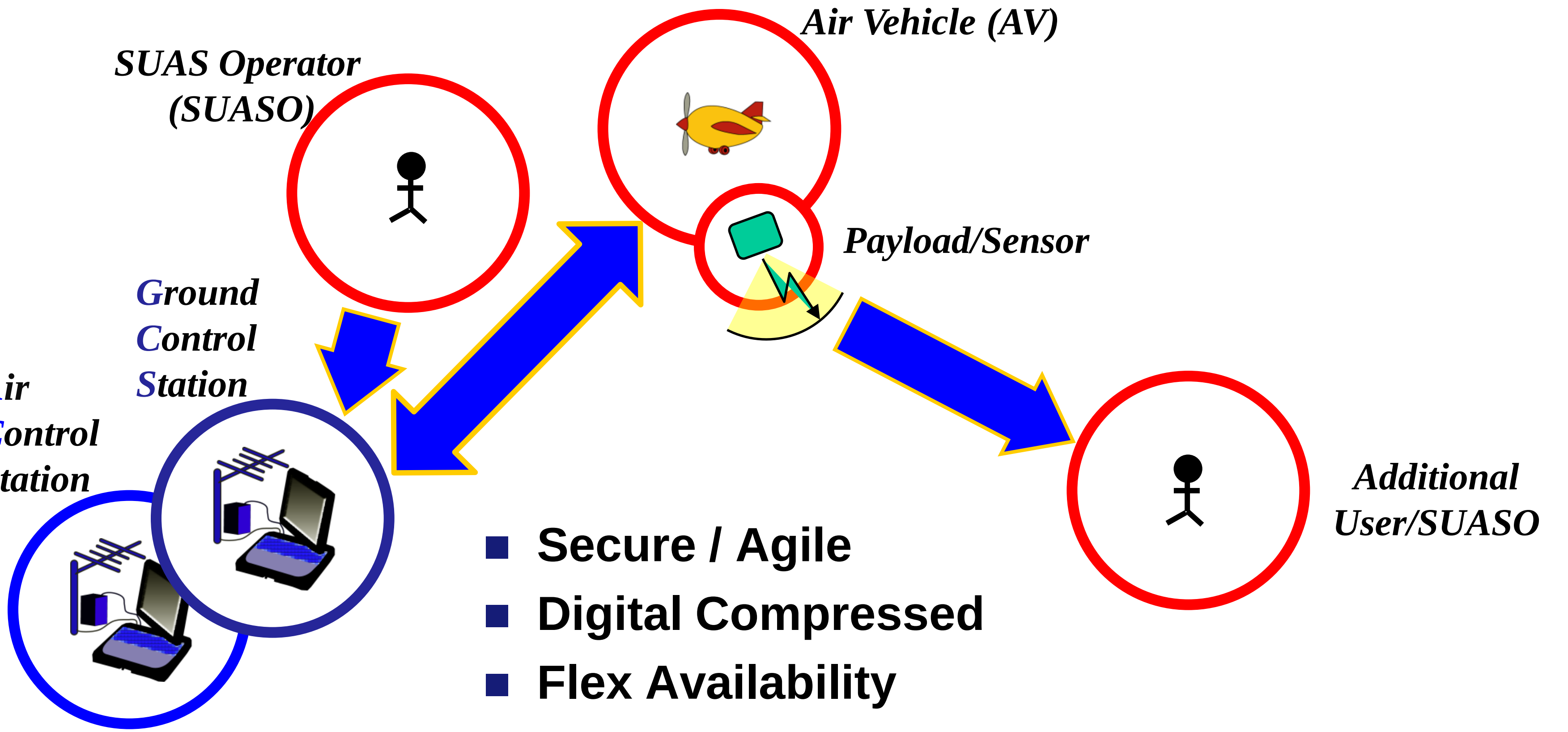
- Reliable components, production standards
- Better – longer lighter batteries
- Propulsion
- Portability
- Navigation w/o GPS
- All-environment capable
- Open architecture
- Documentation
- Transformable / Modular



Sensor

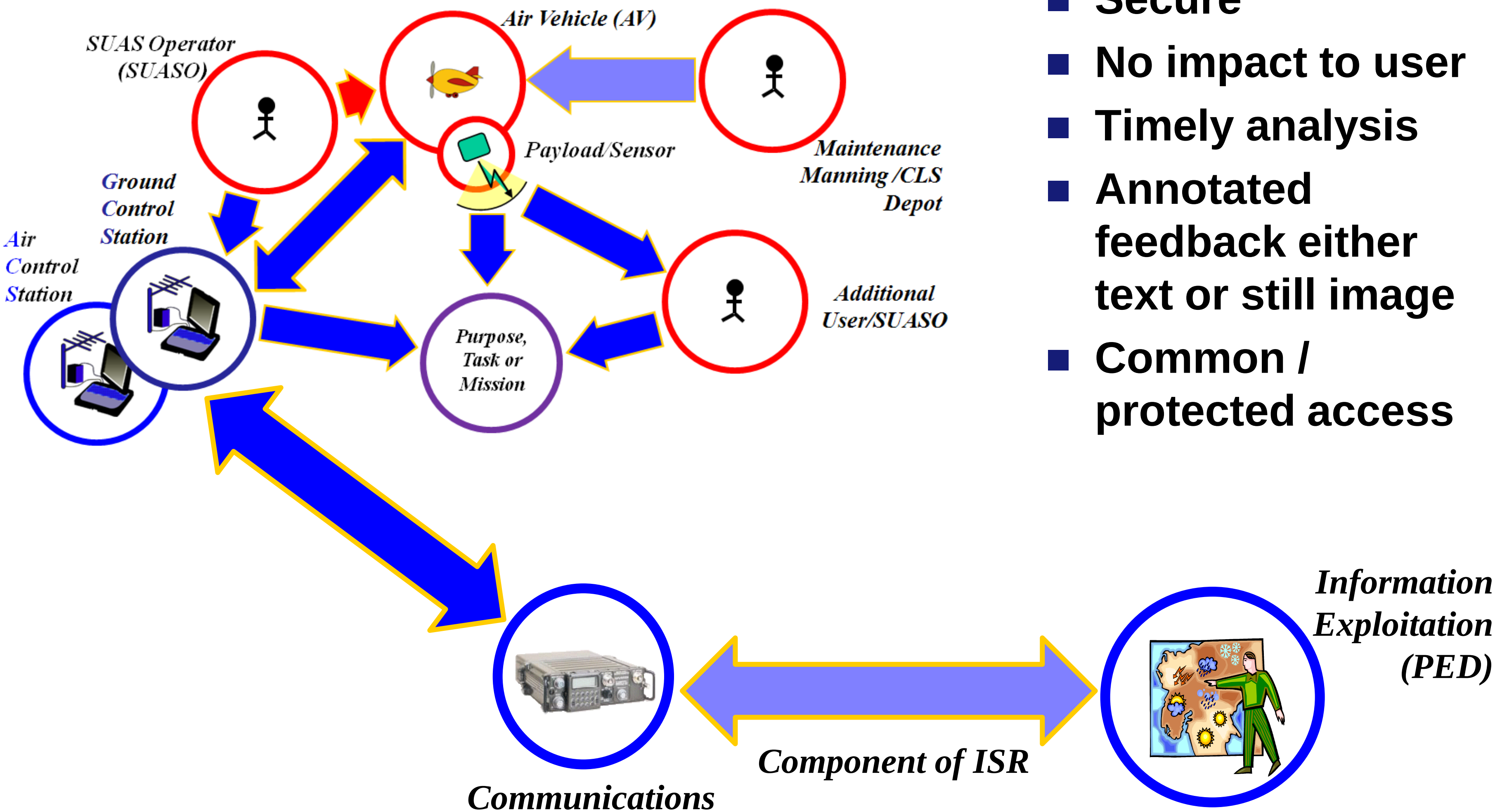
- Modular
- Multi-INT
- Plug & Play
- Day/Night PID personnel
- Accuracy
- Stabilization on board
- Compression
- Sense & Avoid
- Automatic Recognition

Micro: Data Links Challenges



- Secure / Agile
- Digital Compressed
- Flex Availability
- Alternate Waveforms / Gateways
- Backwards Compatible Analog
- No added weight

Micro: ISR Exploit Challenges



- Secure
- No impact to user
- Timely analysis
- Annotated feedback either text or still image
- Common / protected access

AF SUAS Technology Focus

- #1 – Track and Awareness – ability to track our SUAS and know where it is
- #2 – Spectrum Friendly Comms – tunable, digital, jam-resistant, secure, IP-addressable
- #3 – Better Smaller Sensors – Less than 2 lb EO/IR, Small “INT” packages
- #4 – More Power – improve endurance and speed w/o weight, fast recharge, alternative cell technology, small heavy fuel engine
- #5 – Autonomous Navigation – without GPS
- #6 – Sense and Avoid – small sensors to sense and prompt avoiding actions
- #7 – Next Generation – new designs for “transformer system”

Summary

- AF working to integrate all levels of SUAS into its manned / unmanned force mix
- Many opportunities exist for joint collaboration and commonality
- AF supporting COCOMs to get SUAS capabilities to the warfighter faster and smarter
- AF seeks technology from industry and academia to keep our edge in a competitive marketplace

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Questions

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stephen.bishop@hurlburt.af.mil

United States Air Force

Air Force Aerial Targets

October 2008

NDIA Brief

San Antonio, TX

Ms. Michele Brazel

Director

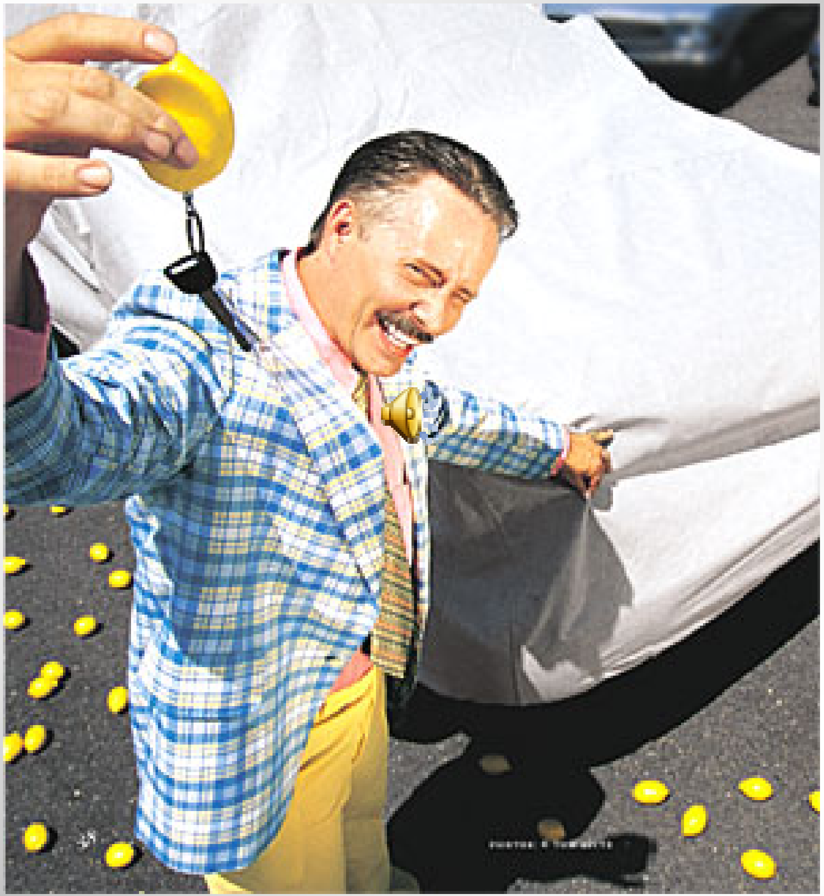
691st Armament Systems Squadron

Eglin AFB, FL

Overview

- **System Description**
- **Organizational Structure**
- **Product Groups**
  - **Subscale Aerial Targets**
  - **Fullscale Aerial Targets**
- **Summary**

Aerial Targets



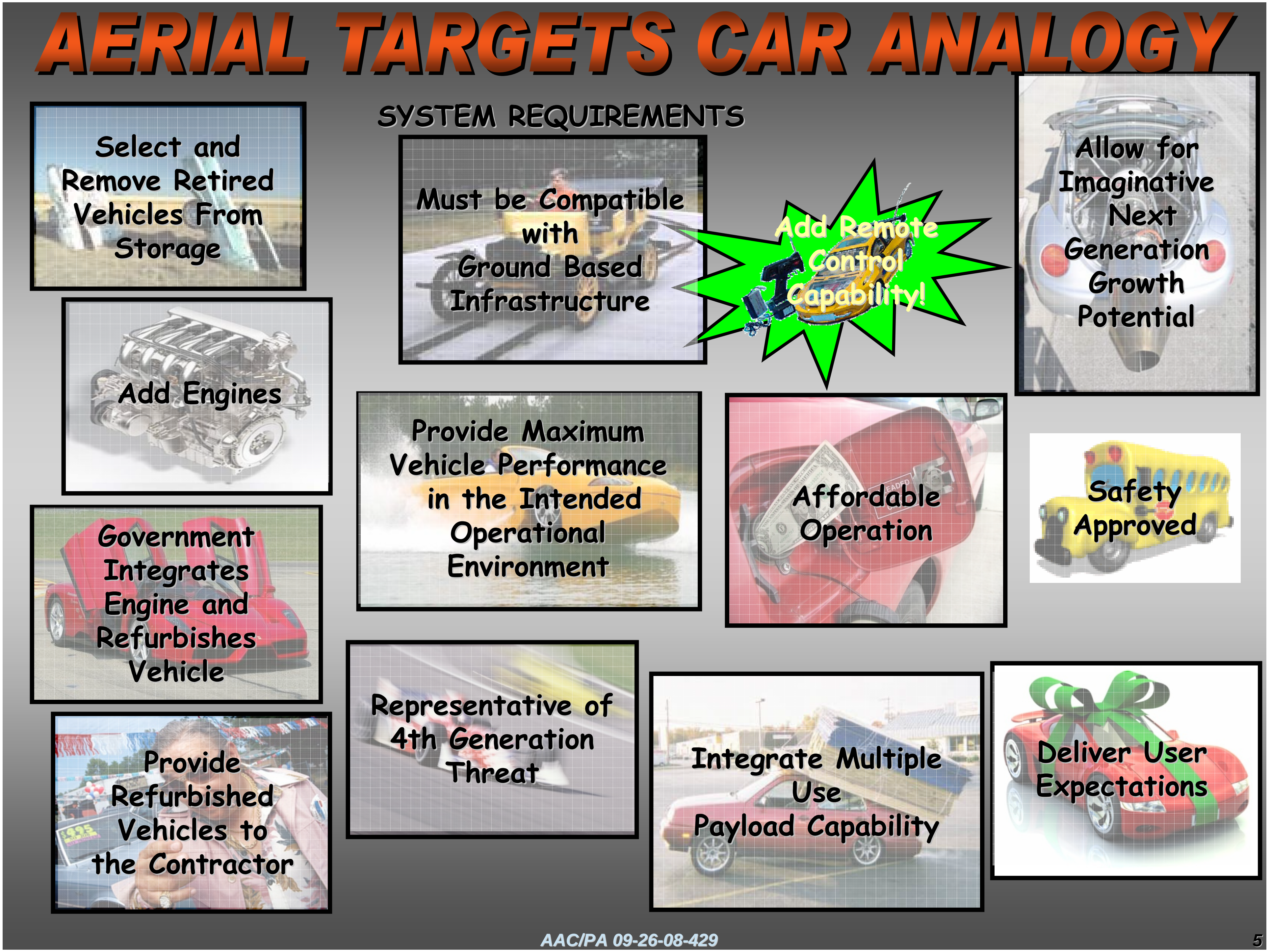
... IT'S JUST LIKE BUYING A CAR!


BLOCK 10


OCK 15


BLOCK 25

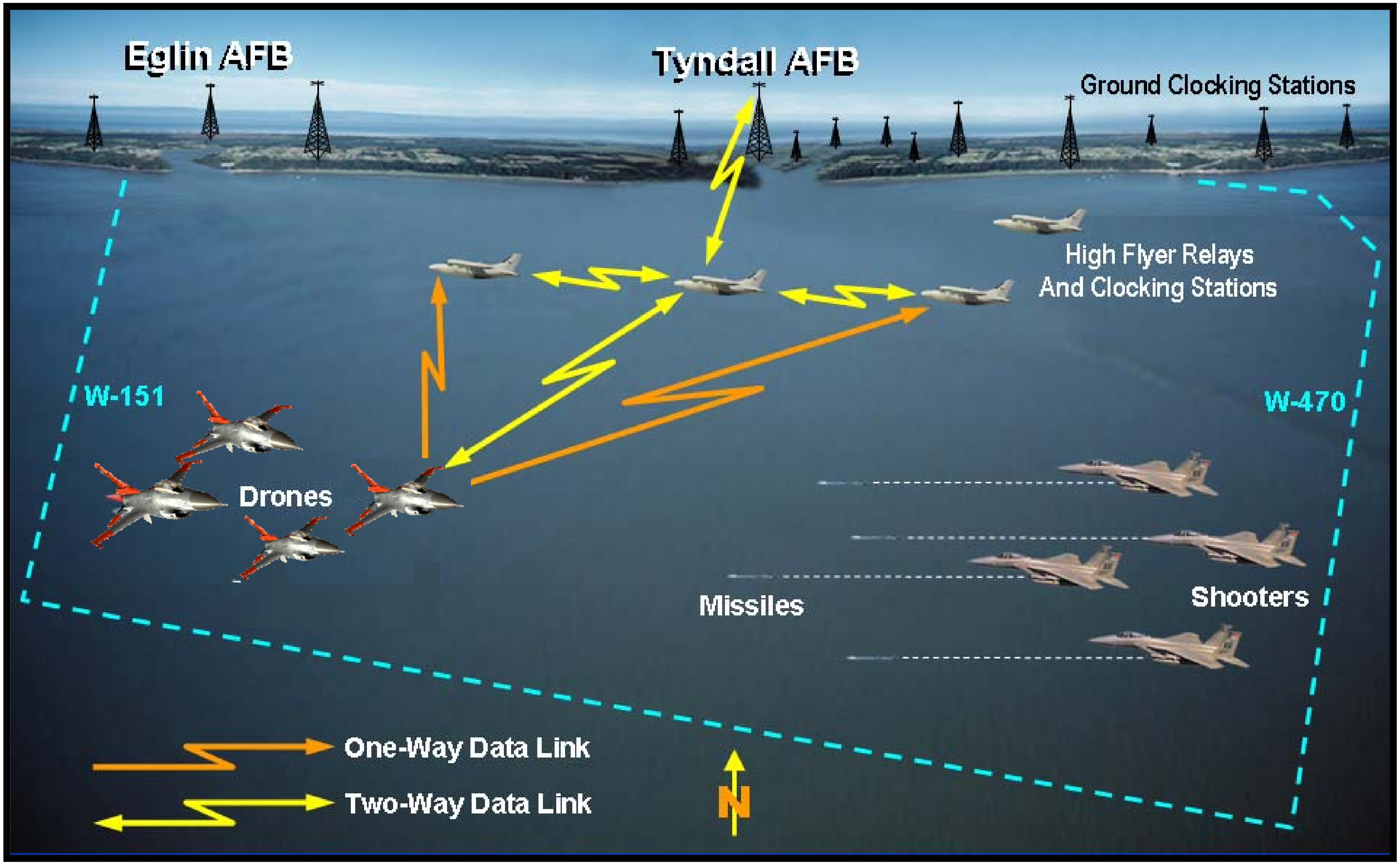

BLOCK 30


AERIAL TARGETS CAR ANALOGY
SYSTEM REQUIREMENTS
Select and Remove Retired Vehicles From Storage
Must be Compatible with Ground Based Infrastructure
Add Remote Control Capability!
Allow for Imaginative Next Generation Growth Potential
Add Engines
Provide Maximum Vehicle Performance in the Intended Operational Environment
Affordable Operation
Safety Approved
Government Integrates Engine and Refurbishes Vehicle
Representative of 4th Generation Threat
Integrate Multiple Use Payload Capability
Deliver User Expectations
Provide Refurbished Vehicles to the Contractor
AAC/PA 09-26-08-429
5

... AND WHEN IT'S PERFECT...

... LET'S BLOW IT UP!

Operational View



Where We Fit In

Air Force Headquarters

Air Force Materiel Command

Maj Gen David Eidsaune, Commander
Air Armament Center

Dr. Bruce Simpson, Director
308th Armament Systems Wing

Col Cyril Socha, Commander
728th Armament Systems Group

Ms. Michele Brazel, Director
691 Armament Systems Squadron

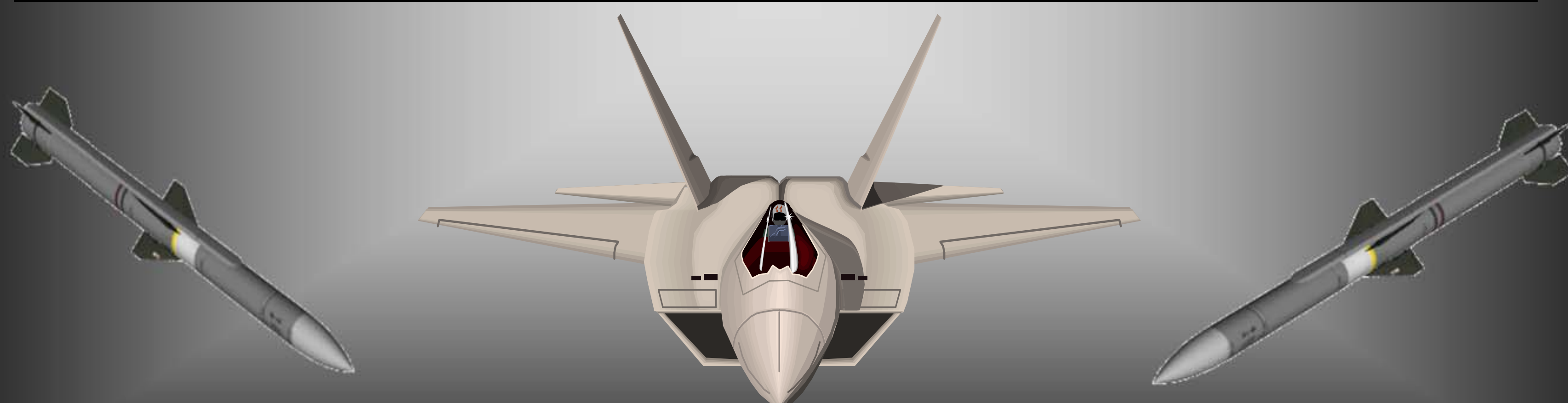
691 ARSS


PCO
Ms. Leanne Green
FINANCE
Ms. Tammy Robbins
DIRECTOR
Ms. Michele Brazel
DEPUTY DIRECTOR
Ms. Audrea Feist
CHIEF ENGINEER
Mr. Allan Pixley
Fullscale Flight Lead
Ms. Holly Reedy
UNMANNED UNARMED UNAFRAID
691ST ARMAMENT SYSTEMS SQ
Subscale & TCS Flight Lead
Mr. Bruce Ringstad
QF-4
Program Manager & Lead Engineer
Ms. Lee Neugin
QF-16 AST
Program Manager
Mr. Ken Hislop
AFSAT
Program Manager
Mr. Jim Cornwell

Who Are Our Customers?

691 ARSS

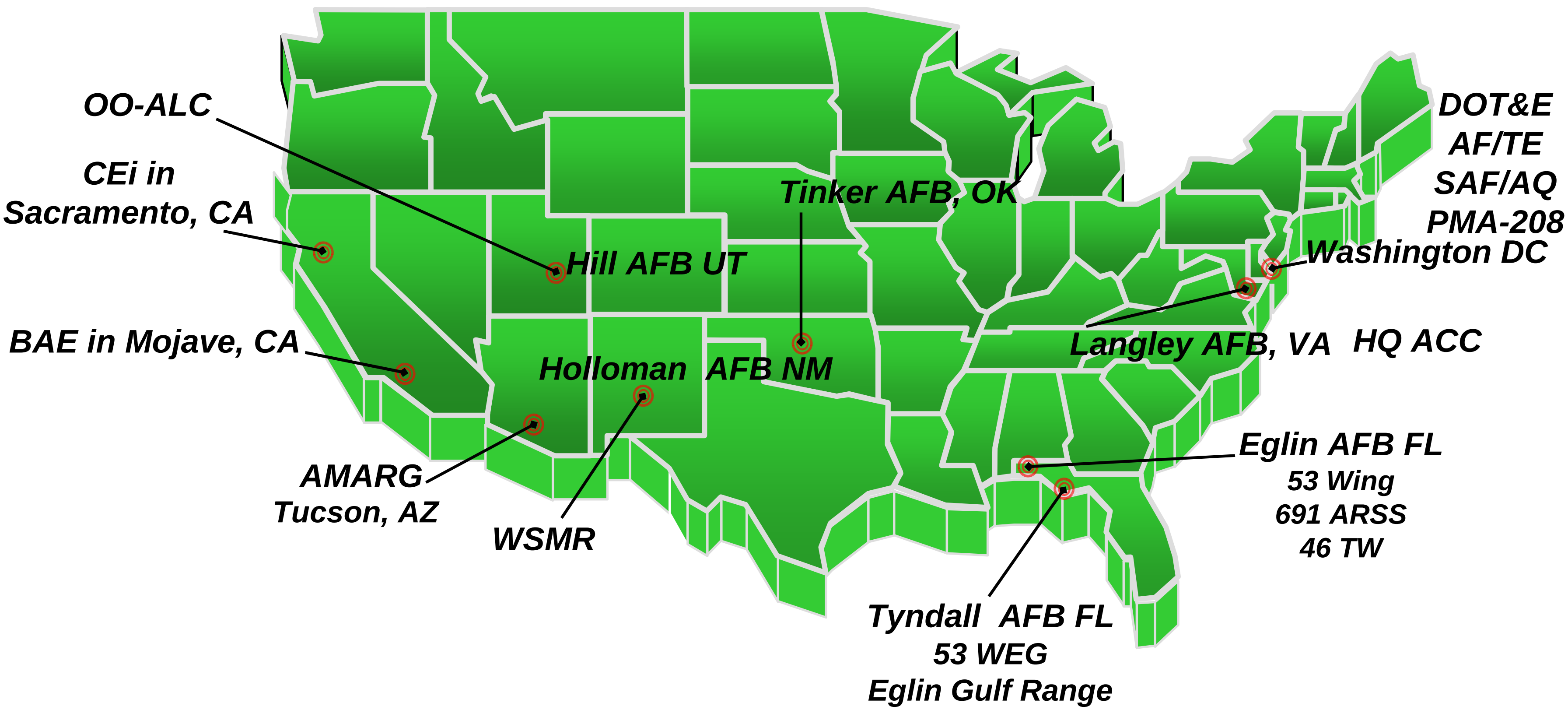
MISSILE DEVELOPMENT PROGRAMS AND TESTERS



SHOOTERS • OPERATORS • MAINTAINERS

USAF Aerial Targets Stakeholders

691 ARSS



AFSAT Sub Scale Aerial Target

Program Manager: Mr. Jim Cornwell

Description

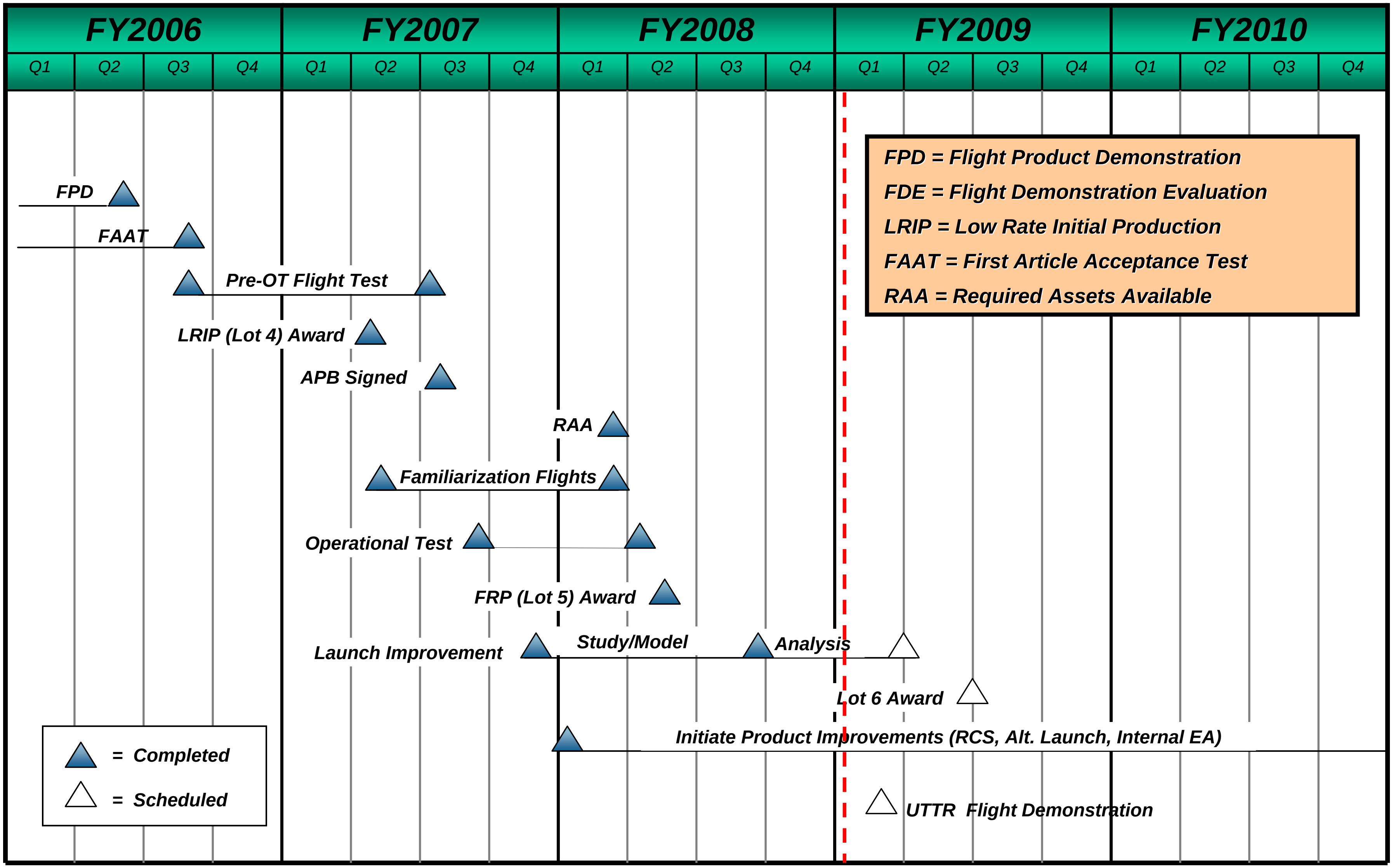
- An Affordable, All-Composite Airframe
- Flies Faster/Slower, Higher/Lower, and Provides 3x+ More Presentations Than Legacy Subscale Targets
- Program in Initial Production Phase
- Prime Contractor is CEi, Sacramento, CA

Key Features

- Supports Title 10 "Live Fire/Lethality"
- Operates via Ground Based Target Control System
- Subsonic, Relatively Heavy Payload Capability

AFSAT Master Schedule

691 ARSS



AFSAT FY08 Accomplishments

- Completed Operational Testing
- Received ACC Fielding Decision
- Obtained Full Rate Production Decision
  - Lot 5 Contract Awarded
- 100th Target Delivered
- 42 WEG Operational "Hot" Missions Supported
  - 73 Launches
  - 243 Presentations
  - 177 Missile shots
- UTTR Demo Planned Nov 08

QF-4 Full Scale Aerial Target

Program Manager: Ms. Lee A. Neugin

Description

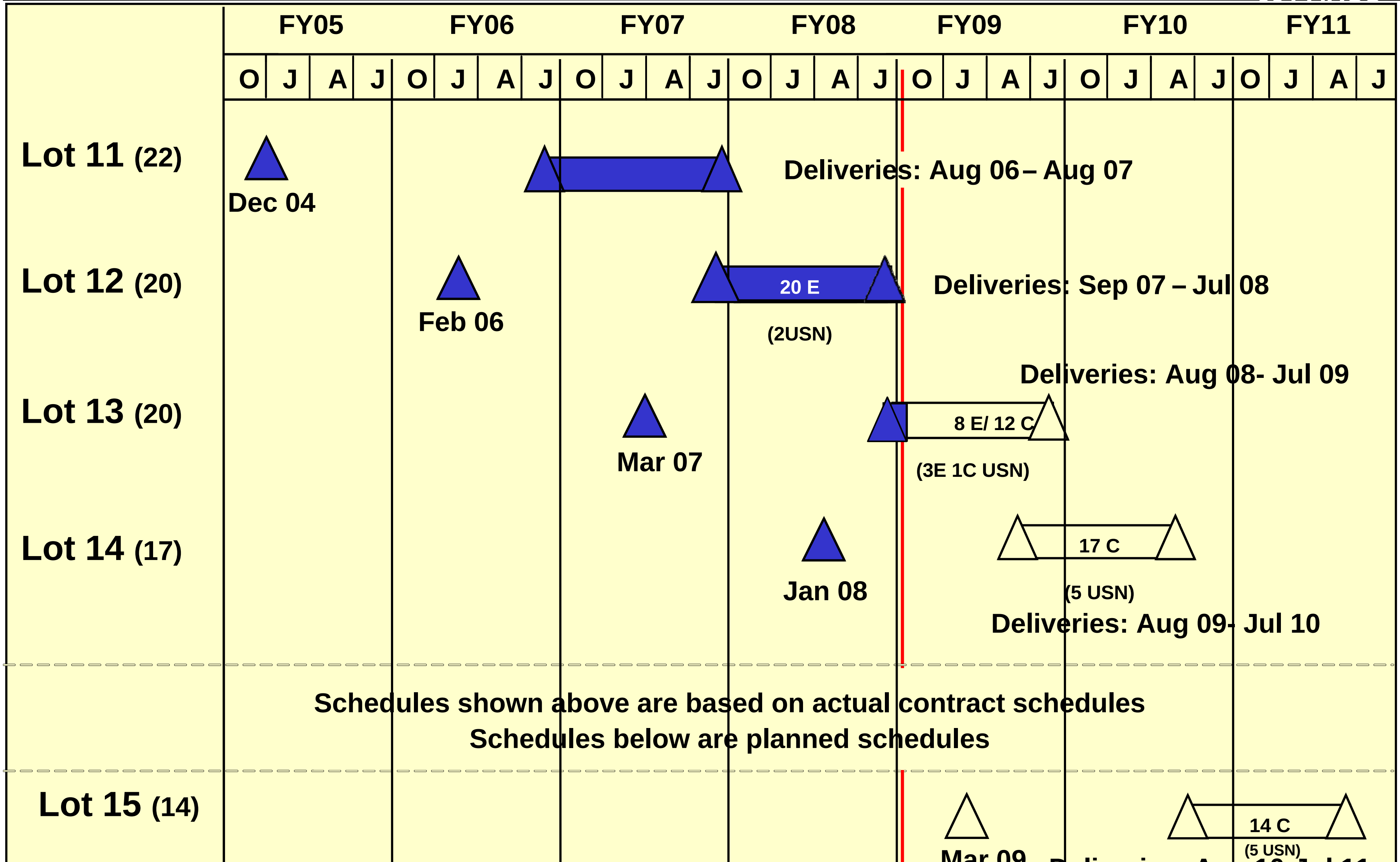
- **Full Scale Aerial Target for Threat-Representative Weapon System Evaluation**
- **Meets USAF, Army, Navy, Allied Test Requirements**
- **Droned Refurbished F-4 Aircraft Out of AMARG**
- **Program in Full Rate Production**
- **Prime Contractor is BAE Systems, Mojave, CA**

Key Features

- **Supports Title 10 "Live Fire/Lethality"**
- **Operates via Ground-Based Target Control System**
- **Supersonic, High-G, Heavy Payload Capability**
- **Provides 3rd Generation Threat Representation**

QF-4 Master Schedule

691 ARSS



QF-4 FY08 Accomplishments

691 ARSS

- **Completed Lot 12 -- Started Lot 13 Deliveries Oct 08**
  – **Total of 244 QF-4s Delivered to Date**
- **Awarded Lot 14 Contract Jan 08**
- **Transitioned from F-4E to RF-4C Production in Jul 08**
  – **Provides Three Additional Years Of Full Scale Capability**
- **Lots 1-14 on Contract with 1 Option Available (Jan 09)**
  – **Two Additional Lots (16 & 17 are planned)**
- **Supported 43 NULLO Test Missions in FY08**
  – **93 Missiles Fired / 18 Kills**

QF-16 Air Superiority Target

Program Manager: Mr. Ken Hislop

Description

- **Full Scale Target for Threat-Representative Weapon System Evaluation**
- **Meets USAF, Army, Navy, Allied Test Requirements**
- **Program in Pre-System Development and Demonstration Phase**
- **Droned Refurbished F-16 Aircraft**
- **Risk Reduction in Progress: Airframes, Engines & Target Control System**

Key Features

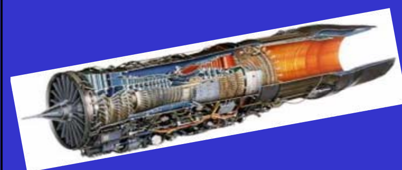
- **Follow on for QF-4 Program: Supersonic, High-G, Heavy Payload Capability**
- **Supports Title 10 "Live Fire/Lethality"**
- **Provides 4th Generation Threat Representation**

QF-16 AST System

Airframe

F-16 A / F-16 C

Engine



F100 – PW Engines

Support /Test Equip

Common F-16 SE
Common F100-PW SE
GRDCS Datalink Tester
GRDCS Trailer

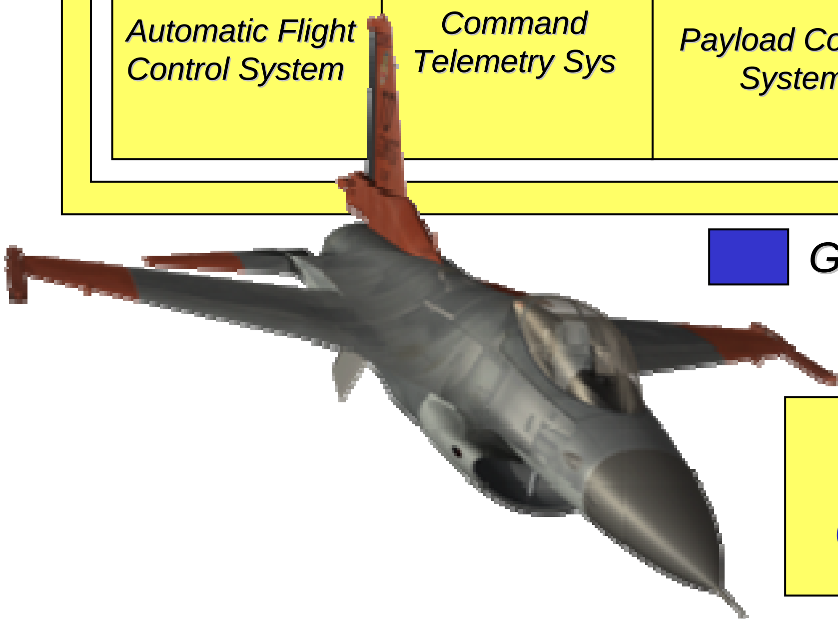
Ground Systems

GRDCS/DFCS (Tyndall/WSMR)
GRDCS Fixed Sites
Scoring Ground Station

Airborne System

Automatic Flight Control System	Command Telemetry Sys	Payload Control System	Flight Termination Warhead/ Fuze	Airborne Scoring System Encryption Chip	Automated Sys Test Sets

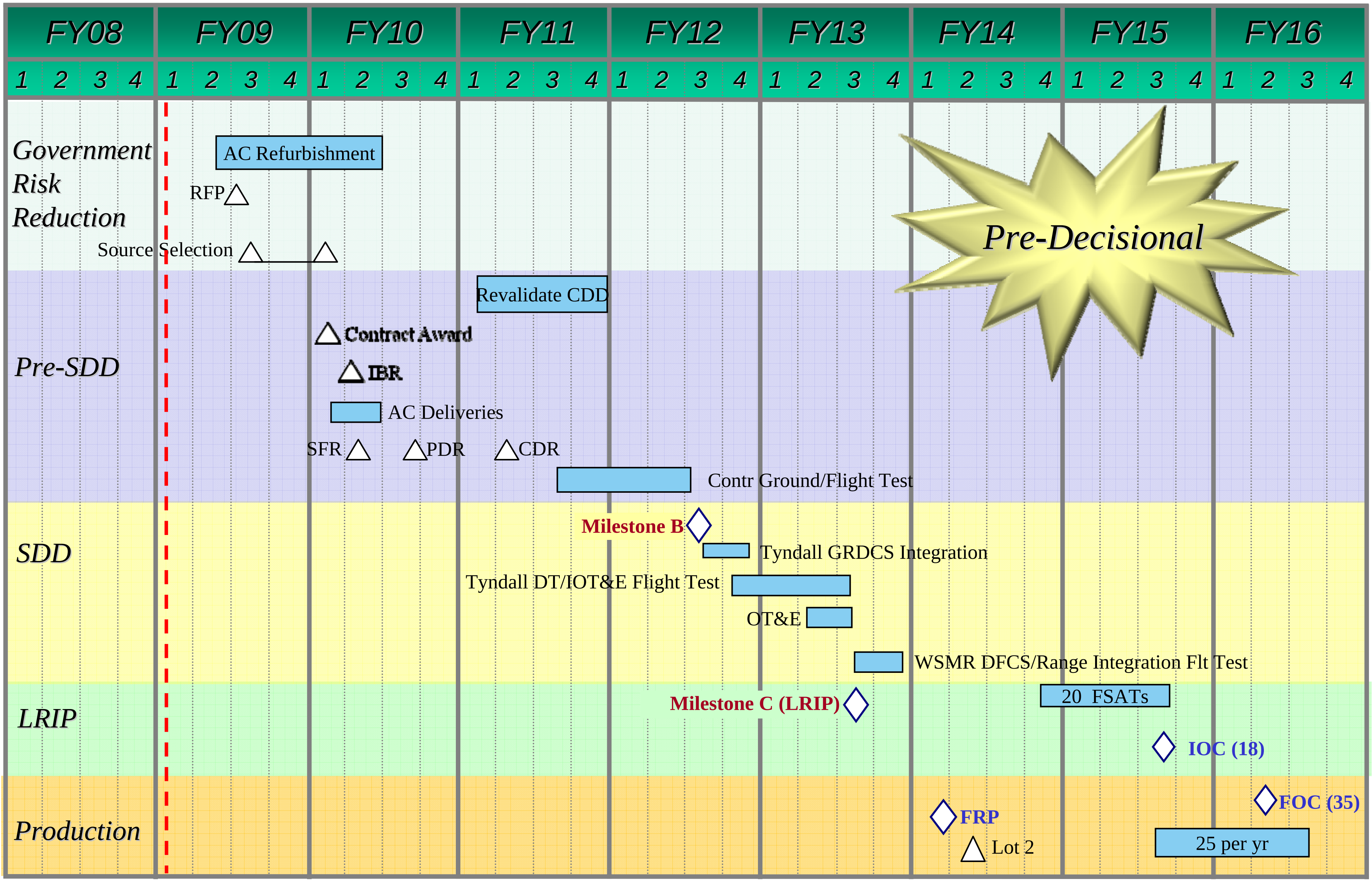
Government Furnished   Contractor Developed



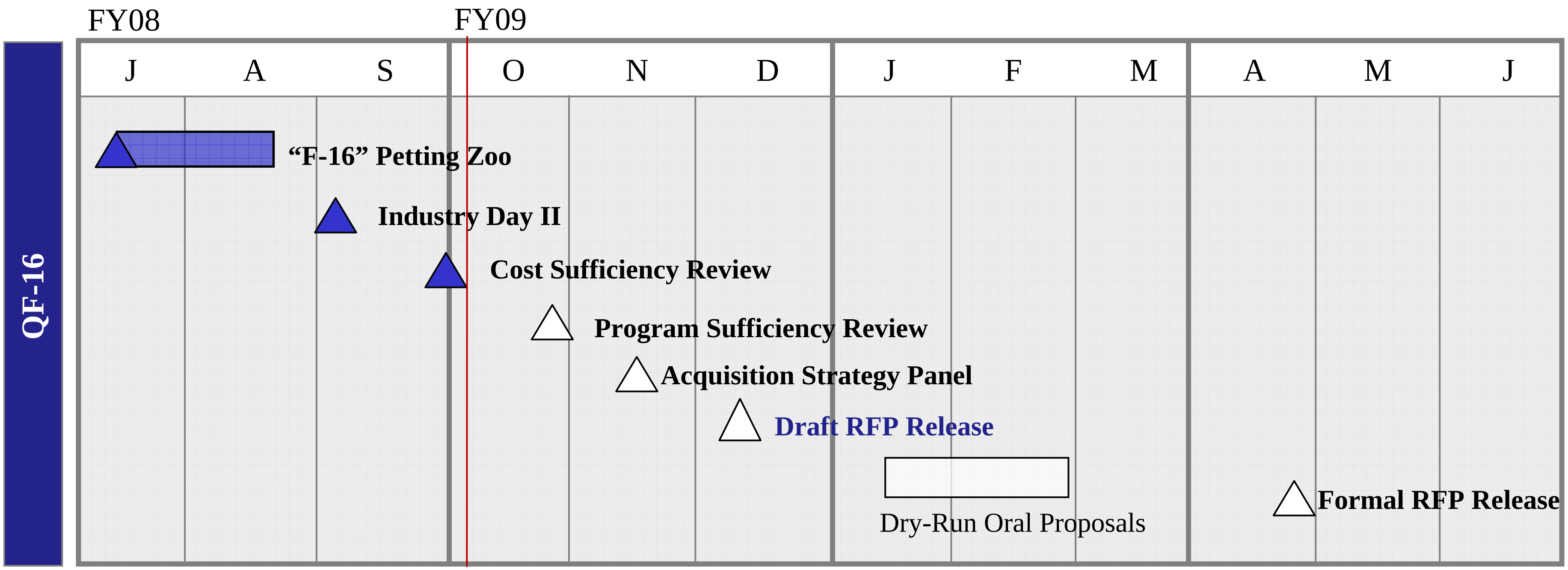
QF-16 System Integration:
Contractor Drone Peculiar Equip w/ GFP

Program Schedule

691 ARSS



QF-16: Path to Contract Award



Contract Award Planned 1QFY10

Direct Inquiries to: *Ms. Leanne Green, QF-16 Contracting Officer*
(850) 883-3382, leanne.green@eglin.af.mil

QF-16 Regeneration

- Aerospace Maintenance and Regeneration Group (AMARG)
  - Regeneration at Davis Monthan AFB, AZ
- Refurbish Aircraft to Applicable Standards
  - All Aircraft will be Man-Rated
  - Will have Between 50 and 300 Hours of Serviceable Life
  - No Service Life Extension or Subsequent PDM Planned
  - TCTOs to be Accomplished by Tail Number
- Will Establish Functional Baseline for Each Block

QF-16 Risk Reduction Activities

- **F-16 Airframe Study Ongoing**
  - **Assessing Condition & Availability of Block 15 and 25s**
  - **Gauging Cost of Refurbishment**
- **Engine Study Completed**
  - **Unmanned Configuration:**
    - **F100-PW-200D w/out Back-up Fuel Control (BUC)**
  - **Manned Configuration:**
    - **F100-PW-220F**

QF-16 Risk Reduction Activities

691 ARSS

- Target Control System (TCS) Risk Reduction Ongoing
  - GRDCS Data Link Tester Development
    - Integrate Government Furnished Ground S/W with Contractor-Developed Airborne S/W
  - Portable TCS
    - Supports Contractor Development Testing
- Petting Zoo (Contractor Aircraft Survey)
  - Allowed Potential Primes Access to Block 15/25 Aircraft
  - Phase I Conducted Jul – Aug 08
  - Potential Phase II in 2QFY09

QF-16 Status

691 ARSS

- CDD Approved 21 Apr 08
  - Currently Assessing Feasibility of Adding Block 30 to SDD
- Program Fully Funded
- 2nd Industry Day Completed Week of 8 Sep 08
  - 70+ Industry Attendees, Representing 17 Companies
- Acquisition Strategy Panel Planned for Nov 08
- Draft RFP Release Planned for Dec 08
- Formal RFP Release Planned in 3QFY09
- Contract Award in 1QFY10

Summary

691 ARSS

- AFSAT Program Meeting User's Need
  - UTTR Demonstration on Track for Nov 08
  - Lot 6-10 Contract Award Planned for 2QFY09
- QF- 4 Program Progressing Well
  - New QRF- 4C Deliveries Beginning 2QFY09
  - Production Planned Through FY13; Depleted in FY15
- QF-16 Program in Full Swing
  - Contract Award Planned for 1QFY10
  - Asset Deliveries Planned to Start FY14; IOC FY15

Questions?

Targets Management Office

Purpose:

Provide NDIA Symposium An Overview Of U.S. Army, PEO STRI, PM ITTS TMO Activities

10 Oct 2008

Briefed by: Mr. Al Brown
TMO Director, PMITTS, PEO STRI
256-876-4077 DSN: 746-4077
e-mail: alvin.brown@us.army.mil

False Impression Caveat

It should be explicitly noted that the U.S. Government makes no official commitment nor obligation to provide any additional detailed information or an agreement of sale on any of the systems/capabilities portrayed during this presentation that have not been authorized for release.

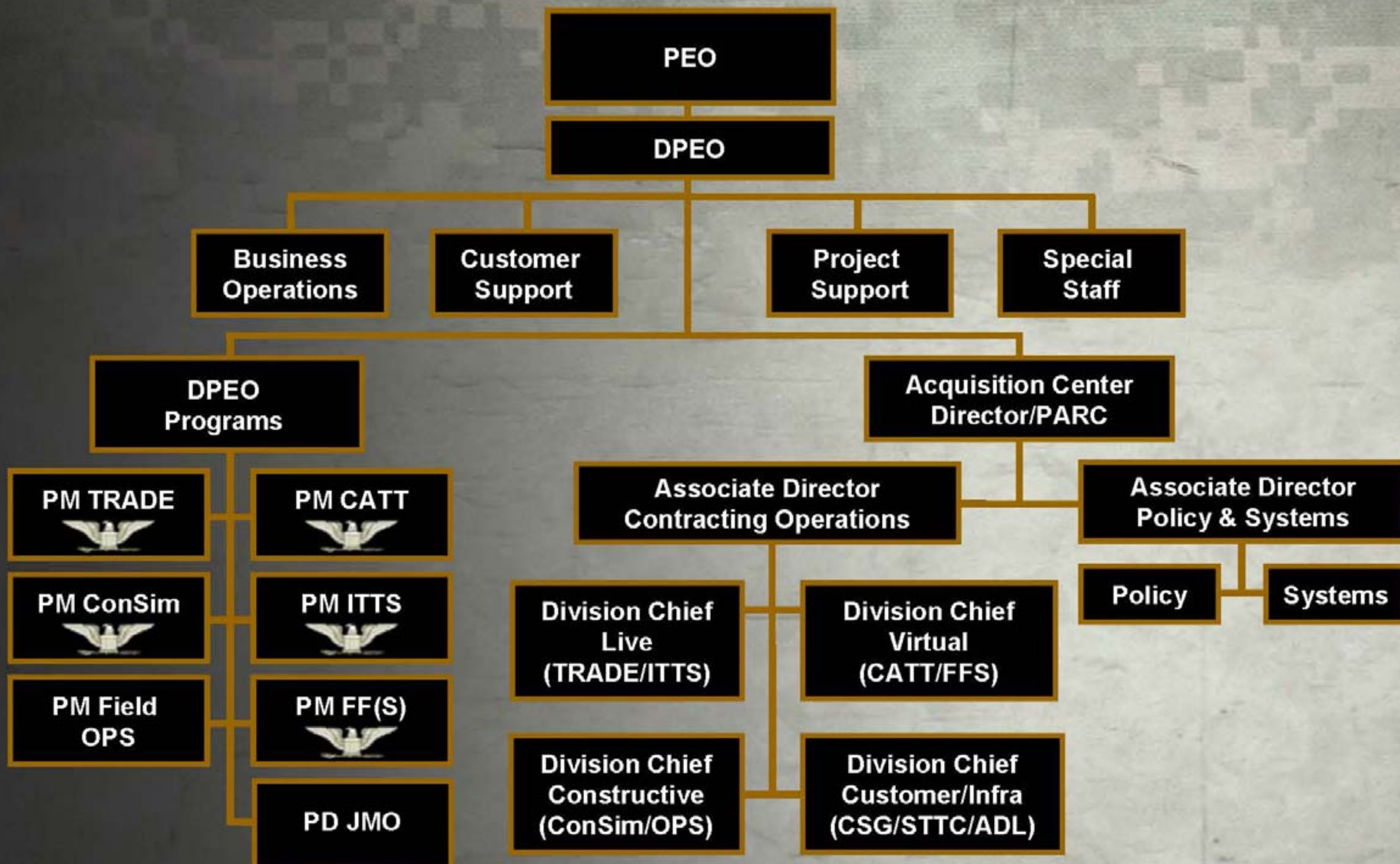
OUTLINE

- Who We Are
- Mission
- Activities
- Organization (Tie-in with Testing & Training)
- Recently Developed Products
- Future Efforts
- Summary

Targets Management Office

PROGRAM EXECUTIVE OFFICE FOR SIMULATION, TRAINING, & INSTRUMENTATION

PEO STRI Organization



PM ITTS Mission

Manage the acquisition of optimized Instrumentation, Target and Threat & Foreign System products and services in support of U.S. Army, Department of Defense, Government, Industrial, and International Customers, and execute non traditional missions as assigned or directed by the PEO.

Organization & Functions

- Function
  - Develop devices that detect, measure, record, transmit, & process data
- Type Testing/Training Supported
  - Developmental Testing (DT)
  - Operational Testing (OT)
- Major Customer Supported
  - ATEC (DTC, OTC), DoD, & Combat System PM's

Director Instrumentation Management Office

- Function
  - Develops, operates, & supports Aerial & Ground targets
- Type Testing/Training Supported
  - Customer Testing, DT, OT, Live Training, & FMS
- Major Customer Supported
  - ATEC (DTC, OTC), DoD, Combat System PM's, & FMS

Director Targets Management Office

- Function
  - Develops, operates, & supports threat representative systems
- Type Testing/Training Supported
  - DT, OT, Training, & FMS
- Major Customer Supported
  - ATEC (DTC, OTC), DoD, Combat System PM's, & FMS

Director Threat Systems Management Office

PM ITTS

Live Virtual and Constructive!

Targets Management Office

PM ITTS

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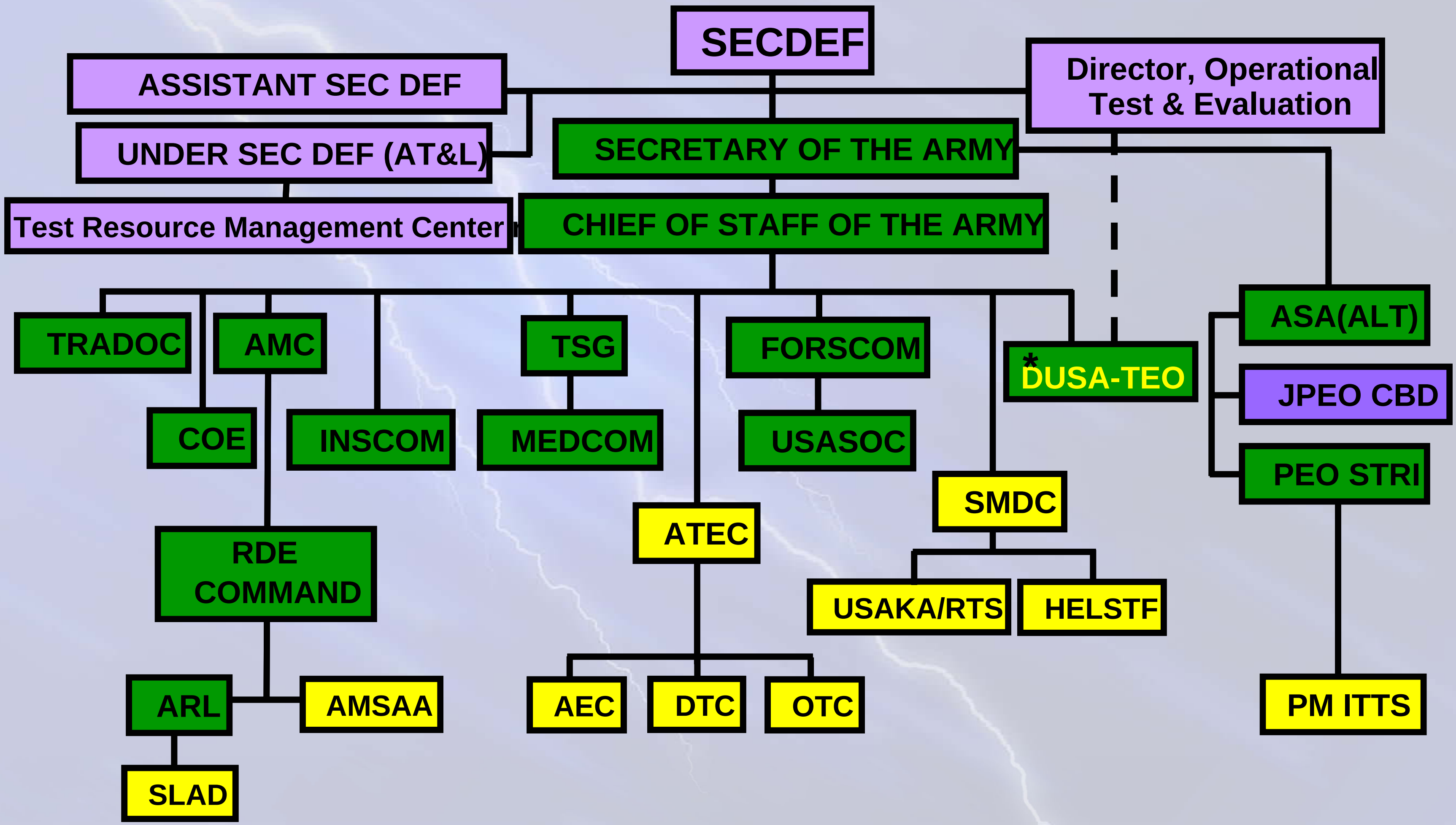
Visit our website at http://www.peostri.army.mil/PM-ITTS

Targets Management Office

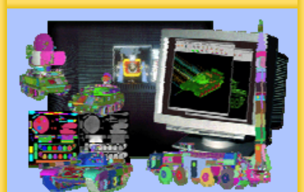


TMO MISSION

- MANAGE THE LIFE CYCLE OF TARGETS, OPERATIONAL THREAT VEHICLES, TARGET CONTROL SYSTEMS AND GROUND RANGE SYSTEMS USED IN LIVE AND VIRTUAL TESTING, AND TRAINING.
- PROVIDE BEST VALUE ACQUISITION, SUPERIOR LIFE CYCLE SUSTAINMENT AND OPERATION FOR THE U.S. ARMY AND INTERNATIONAL CUSTOMERS.
- EXECUTE MISSIONS AS ASSIGNED OR DIRECTED BY PEO STRI AND PM ITTS.

Targets Management Office

PRIMARY ACTIVITIES





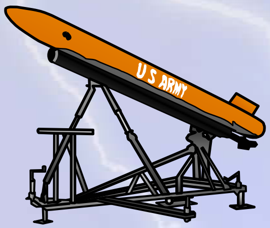
Based on Customer Target Requirements

- **Aerial – Fixed and Rotary Wing**
- **Mobile Ground / Foreign Materiel**
  - **- "Real Deal Steel"**
  - **- Surrogates**
- **Virtual – Models and Simulations**
- **Precision Targetry Systems**
- **Auxiliary / Ancillary Equipment**




Targets Management Office

WHAT WE DO



Develop products

Buy products

AND we

- Fly ’em
- Drive ‘em
- Fix ‘em

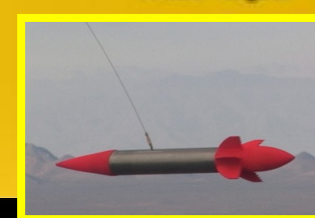
Aerial Targets

take your BEST SHOT

Remote Piloted Vehicle Target

- Turnkey Operations
- Target systems flight services supporting Army and Tri-service test and training and FMS requirements
- Low Cost

Towed Targets



*Aerial Target Flight Services

Simulate Aerial Threats World-Wide in Live and Virtual Domains

Mobile Ground Targets

take your BEST SHOT

Centrally Manage and Execute:

- Over 340 assets
- Mobile Ground Targets for development and operational testing
- Multiple usage options:
  - Rent
  - Lease
  - Buy

Threat Representative Targets in Live and Virtual Domains

Targets Management Office

Virtual Targets Program

take your BEST SHOT

- ***Virtual Targets Project***: Building simulation target models capable of being used in synthetic signature prediction analysis software programs

- ***Target Generation Laboratory***: Transitioning CAD models into simulation compliant visual, infrared, and radar frequency simulation target models

- ***Army Model Exchange***: Distributing simulation target models to simulation developers th rmy T&E community

3 Interrelated Components Supporting M&S for T&E

Targets Management Office

Air Defense Artillery Targets

take your BEST SHOT

Provides aerial target and scoring support for Air and Missile Defense (AMD) units requiring home-station training in accordance with DA PAM 350-38, Standards in Training Commission (STRAC) requirements and National Training Center (NTC) support.

- Contractor Operational Teams
- Deployable worldwide
- Very low cost for training & testing

What we have developed recently

Low Cost Movers

Threat Vehicle
Surrogate Targets

Virtual Targets

UAS-Ts

JCHAAT

Things we plan to develop/purchase in the next five years

Medium Speed Aerial Targets

Precision Targets

RPVTs

Fully Mission Capable Threat Targets

Looking at technology areas to enhance current capabilities

Rotary Wing Targets

An Individual Product we plan to develop/purchase during the next five years

Precision Targets

Develop state-of-art signature technologies and applications for use on existing targetry or new targetry development efforts to support Army requirements.

<u>Develop concepts that:</u>

- Minimize cost
- Maximize signature fidelity – visual and thermal
- Minimize logistic requirements – reduce handling cost, easily transportable, easy to assemble, recyclable
- Maximize utility – adaptable to CCD&O technologies

An Individual Product we plan to develop/purchase during the next five years

Fully Mission Capable Threat Ground Targets

Acquire and field fully mission capable latest version, Foreign Threat Mobile Ground Targets (MTB, IFV, and APC) to meet emerging requirements for threat representative missions.

Capabilities will include:

Operational Turrets
Communications
Shoot-back capability
Operational Sights
Smoke (VEESS, launchers)
Ancilliary Equip

An Individual Product we plan to develop/purchase during the next five years

Remotely Piloted Vehicle Targets

Provide targets with ancillary devices and contractor support services for STRAC mandated live-fire crew gunnery weapon qualifications and missile engagement events.

Government Owned/Contractor Operated Aircraft.

An Individual Product we plan to develop/purchase during the next five years

Medium Speed Aerial Target

Acquire a drone that meets users' requirements that are below those of the MQM-107.

Develop concepts that:

•Minimize life-cycle cost
•Minimize logistic requirements – reduce handling cost, easily transportable, easy to ready for flight
•Maximize utility – meet many users needs that currently are using higher cost drone

An Individual Product we plan to develop/purchase during the next five years

Rotary Wing Targets

Most Likely Not This

present realistic, threat representative, helicopter targets for use by Test and Evaluation and by Training groups worldwide.

SUMMARY

TMO:

- **ALWAYS LOOKING FOR A BETTER, FASTER, CHEAPER PRODUCT FOR OUR CUSTOMERS**
- **RECOGNIZED LEADER OF AERIAL AND GROUND TARGETS**
- **READY TO RESPONSIVELY AND RESPONSIBLY SUPPORT T&E AND SPECIAL TRAINING REQUIREMENTS**

NEED INDUSTRY TO CONTINUE PROVIDING STATE OF THE ART TECHNOLOGIES FOR ADAPTATION AND INCORPORATION INTO TARGETRY

Targets Management Office

Providing/Operating Aerial, Ground and Virtual Targets.

Gulf Range Drone Control System (GRDCS): Past, Present, and Future

Mrs. Sandra Brown
Specialized Engineering Flight Chief
46 RANG/VTSO
Eglin AFB, FL

October 9, 2008

Outline

- **Past**
  - Brief History
  - Historical Milestones
  - Historical Drones
- **Present**
  - Current Drones
  - Capability
  - Development Team
  - Ranges
  - Utah Test and Training Range
  - GMCS/WMCS
  - Recent Additions
- **Future**
  - In Development
  - Future Drones
  - Potential Projects

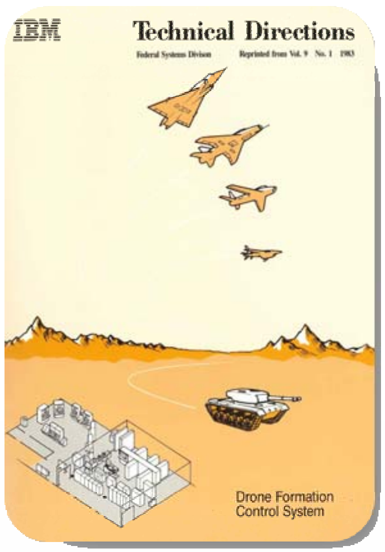
GRDCS

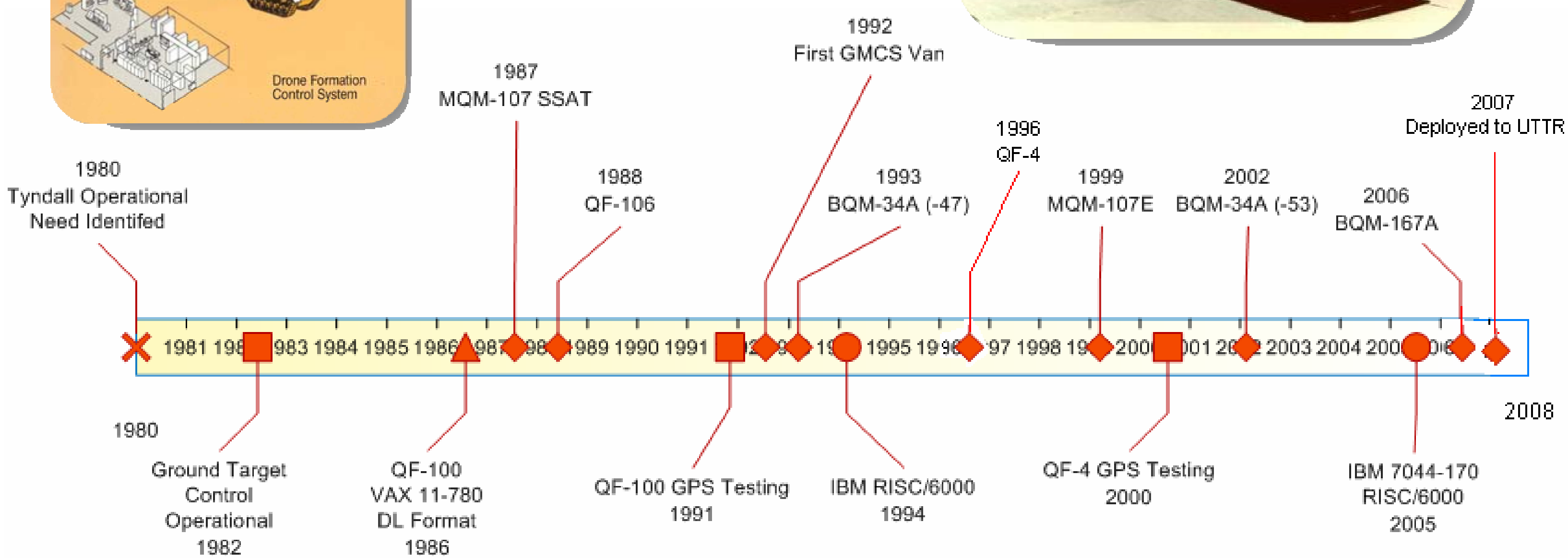
- **<u>G</u>ulf**
- **<u>R</u>ange**
- **<u>D</u>rone**
- **<u>C</u>ontrol**
- **<u>S</u>ystem**

Past – Brief History

- **Developed in Early 1980's to Support AMRAAM**
- **"In-House" Technical Expertise to Develop System**
  - 96th Communications Group (96 CG) –
    Computer and Software Resources, Drone Integration
  - 46th Test Wing (46 TW) – Datalink System, Consoles, Tower, Infrastructure
- **Derived from Existing Systems**
  - White Sands Missile Range (WSMR)
    Drone Formation Control System (DFCS)
  - Eglin Central Control Facility (CCF) Real Time System

GRDCS Historical Milestones





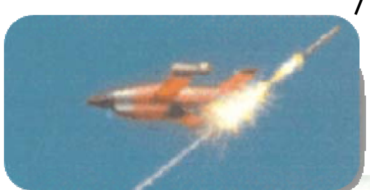
Operationally Oriented; Customer Focused

Past – Historical Drones

- **Full Scale**
  - QF-100
  - QF-106

Past – Historical Drones

- **Sub-Scale**
  - MQM-107 D/E
  - BQM-34 A/P



Present – Current Drones

- **Full Scale**
  - QF-4
- **Sub-Scale**
  - BQM-167 A

Present - Capability

- **Simultaneously Track and Control any Combination of 6 Drones**
  - **Flight Paths**
  - **Formations**
    - Dynamically changeable
    - Collision escapes and avoidance
  - **Maneuvers**
    - 25+ pre-programmed
    - Linked in sequence
  - **Escapes**
    - Aircraft orbit offshore at 20K MSL
    - Auto flight termination on datalink loss

- **Track**
- 4 shooters
- 4 high fliers (relays)
- 2 other aircraft
- **Track and Terminate 4 Missiles**
- **Fly Drones Manually or Automatically**
- **Over the Horizon and Line of Sight Tracking**

Present – Capability (Continued)

- **GRDCS Mission Simulator**
  - Full 6DOF Simulation of All Supported Targets
  - Utilized for
    - Mission practice and preparation
    - Software testing and validation
    - Controller training
- **Government**
  - Developed
  - Owned

Present – Development Team

- **46th Range Group**
  - Team Based at Eglin
  - Validate Autopilot Software
  - Integrate New Drones
  - Mission Support
  - GRDCS System Improvement Requests
  - Data Analysis
  - Create Test Plans
  - Develop Models

Software/Systems Engineering Process Improvement Highlights

Software Technology Support Center

CERTIFICATE OF ACHIEVEMENT

This recognizes that the

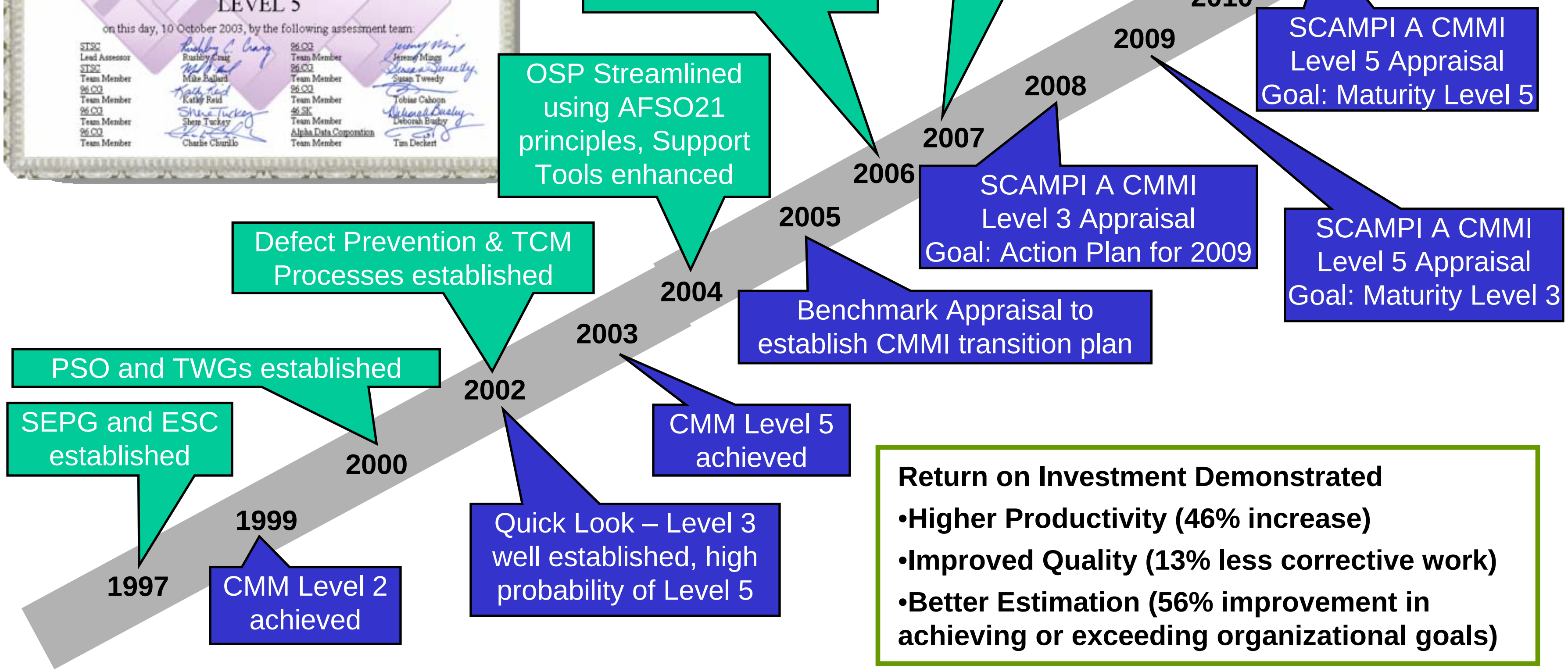
96th Communications Group
Eglin AFB, Florida

has successfully achieved a
Software Engineering Institute, Capability Maturity Model rating of

LEVEL 5

on this day, 10 October 2003, by the following assessment team:

STSC Lead Assessor	Rushby Craig	96 CG Team Member	Jeremy Mings
STSC Team Member	Mike Ballard	96 CG Team Member	Susan Tweedy
96 CG Team Member	Kathy Reid	96 CG Team Member	Tobias Cahoon
96 CG Team Member	Shere Tuckey	46 SK Team Member	Deborah Busby
96 CG Team Member	Charlie Churillo	Alpha Data Corporation Team Member	Tim Deckert



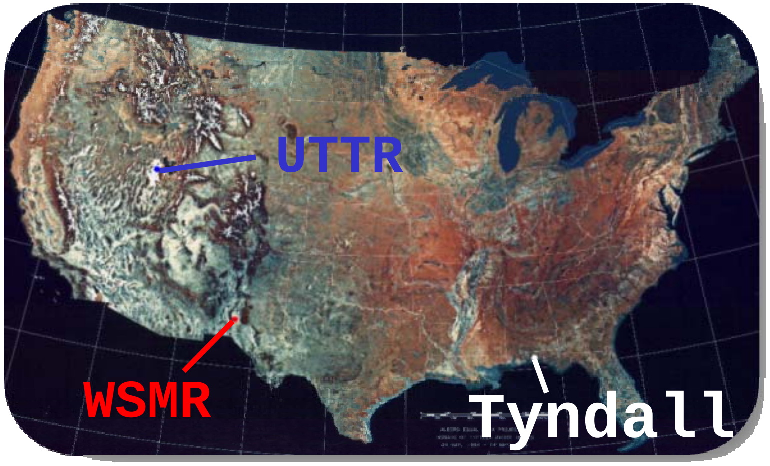
Return on Investment Demonstrated

- **Higher Productivity (46% increase)**
- **Improved Quality (13% less corrective work)**
- **Better Estimation (56% improvement in achieving or exceeding organizational goals)**

Operationally Oriented; Customer Focused

Present - Ranges

- **Tyndall and Eglin**
  - Main mission operations (53rd WEG)
  - GRDCS Software Development (46th TW)
  - New target acquisition (691st ARSS)
- **Holloman AFB / WSMR, NM (WMCS)**
  - Support full scale target operations (53rd DET)
- **Utah Test and Training Range (UTTR)**
  - Support combined Combat Archer and Combat Hammer evaluation (53rd WEG)



GRDCS:

Utah Test and Training Range (UTTR)

- **Successfully Tested GRDCS Mobility**
- **UTTR Fall 2007**
- **Completed QF-4 Range Sweep Data Collection**
- **Capable of Flying BQM-167A Target**
- **BQM-167A Flight Scheduled for November 2008**

Present – GMCS and WMCS

- **GRDCS Mobile Control System (GMCS)**
- **WSMR Mobile Control System (WMCS)**
- **Used for “Wounded” Drone Recovery**
  - Chase pilot visually ascertains damage
  - Controller performs controllability check
  - Mission commander determines if recovery should be attempted
  - Flown to short approach by GRDCS
  - Hand-off to GMCS for final recovery
- **Available as Backup Control if Main Control Facility Goes Down**

Present – Recent Additions

- **Linux based I/O Control System**
  - Linux GRDCS IO (LGIO)
    - Replaces AIX I/O Computers
    - Supports ISc Interface
  - C-Band Radar Interface
    - Bi-Phase Serial Data
    - Flight Termination System Data
  - Designed for Interoperability
- **Future Features**
  - Joint Advanced Missile Instrumentation (JAMI) Interface
  - Non-Developmental Item—Airborne Instrumentation Unit (NDI-AIU) Interface
  - Search Radar Interface
  - Range Instrumentation Grid (RIG) Data
  - Output Translated Slaving Data

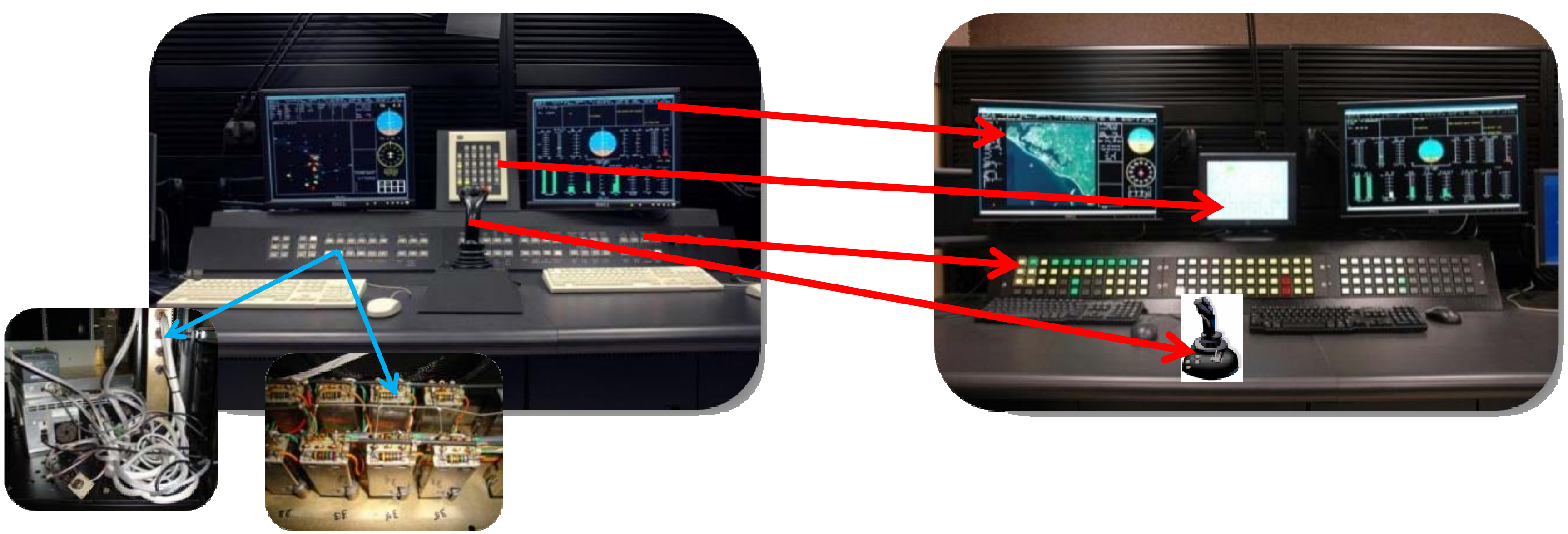
Future – In Development ProLog Replacement

Old

- Standard Monitors
- IBM Proprietary Pushbutton Input
- Individually Wired Pushbuttons with Overlay
- Specialized Controller Joystick

New

- Widescreen Monitors
- COTS Touch Screen
- Integrated Connection Programmable LCD Pushbuttons with Standard Serial Interface
- USB Joystick



Future – In Development Display Update

Old

- IBM Proprietary GraPHigs
- IBM Proprietary Hardware
- IBM Proprietary OS
- Wireframe Only

New

- Modern Open Standard OpenGL
- COTS PCs
- Linux Based OS
- Modern Display Technology

Future – In Development

- **Convert Servers to Linux**
  - Migrate Control Processors to Linux
  - Provides Support for Multiple Programming Languages
- **Decoupled Simulation**
  - GRDCS Core Processes Run Independently of Simulator Processes
  - Modular Interface
- **GRDCS Mission Management**
  - Enhance System Startup and Configuration to Point/Click Interface
- **Enhanced Logging**
  - Record More Data
- **Real-time Matlab® Analysis Capability**

Future - QF-16 Integration

Operationally Oriented; Customer Focused

Future – Potential Projects

- **Replay Capability**
- **Additional Datalink Interfaces for Interoperablity**
  - UHF
  - Link-16
- **Flight Path Management**
  - Enhance Flight Path to be Based on Time and Location
  - Possible Touch Screen User Input
- **Terrain Avoidance**
  - Use DTED Maps to Provide Notification of Terrain Abnormalities
- **GPS Based Navigation**
- **3D Visualization**
  - Provide Different Views
  - Used with Replay for Personnel Training

Conclusion

- **Past**
  - Brief History
  - Historical Milestones
  - Historical Drones
- **Present**
  - Current Drones
  - Capability
  - Development Team
  - Ranges
  - Utah Test and Training Range
  - GMCS/WMCS
  - Recent Additions
- **Future**
  - In Development
  - Future Drones
  - Potential Projects

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U.S. Navy Aerial Target Systems

Presented to 46th Annual NDIA Symposium

Captain Pat Buckley
Program Manager
PMA-208, Aerial Target & Decoy Systems
10 October 2008

Outline

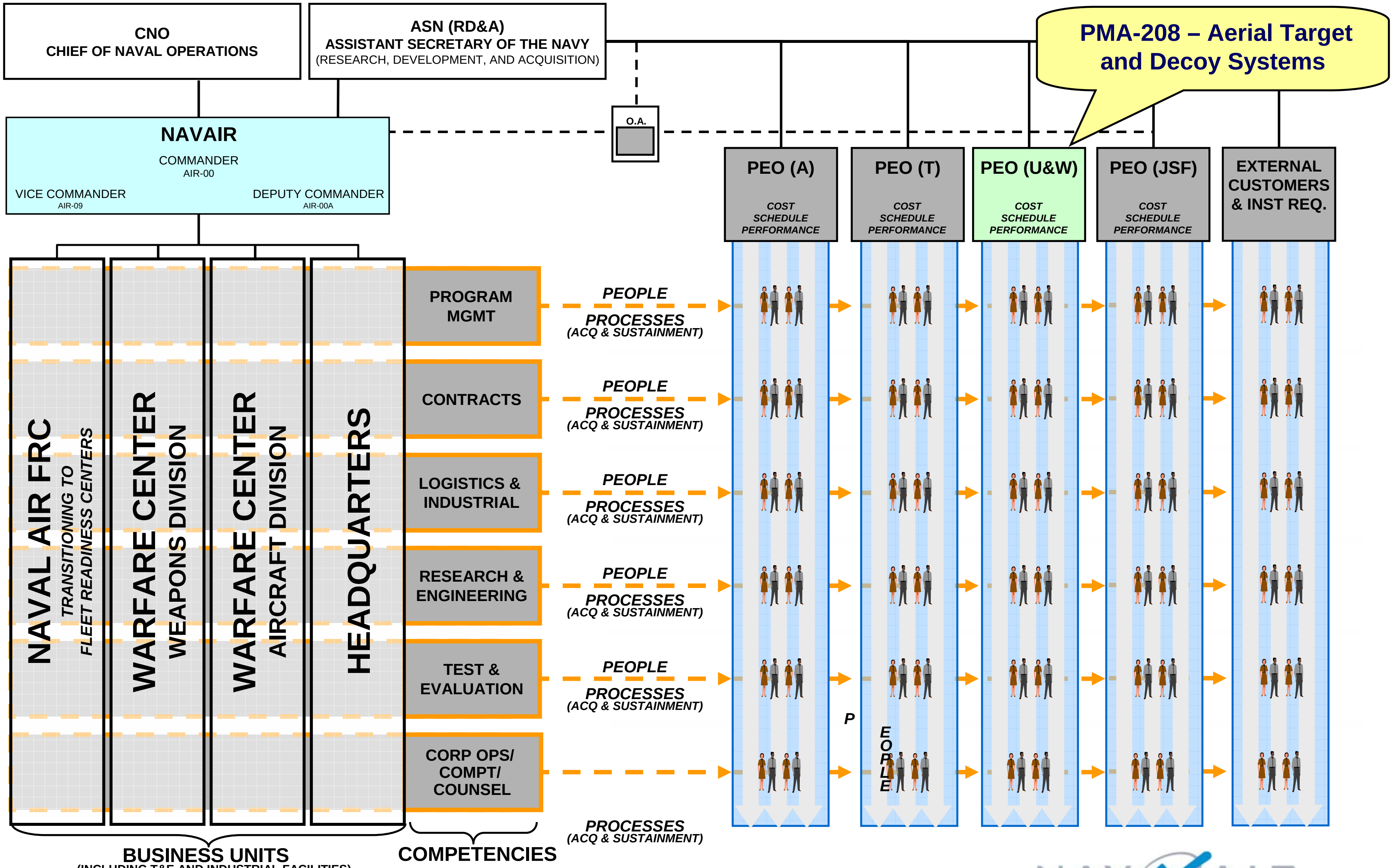
- Organization
- Product Line
- Operating Sites
- Supersonic Targets
- Subsonic Targets
- Full Scale Targets
- Target Control System
- Summary

PMA-208
AERIAL TARGET & DECOY SYSTEMS
PROGRAM OFFICE 2008

- **PROGRAM MANAGER**
  CAPT PAT BUCKLEY
  PMA-208
  - **TTSP/ETG**
    TOM WILLIAMS, PMA2087
  - **DECOY SYSTEMS**
    DAN WRIGHT, PMA-2085
  - **PRINCIPAL DEPUTY**
    TIM BARNES
    PMA-208A
    - **MULTI-STAGE SUPERSONIC TARGET IPT**
      DOUG TROLLINGER, PMA-2088
    - **SUPERSONIC TARGET SYSTEMS IPT**
      CHARLIE MANSON, PMA-2081
    - **FULL SCALE AND SUBSONIC TARGET SYSTEMS IPT**
      RAY GAGNON, PMA-2082
    - **SUBSONIC SUBSCALE AERIAL TARGET IPT**
      RAY GAGNON (acting), PMA-2083
    - **CONTROL SYSTEMS AND COMMON TAAS IPT**
      LCDR CHRIS SACCO, PMA-2084

NAVAIR & Aviation PEOs Organization

COMPETENCY ALIGNED ORGANIZATION/INTEGRATED PROGRAM TEAMS (CAO/IPT)



PMA-208 Product Line

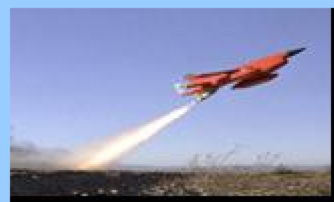
Supersonic

GQM-163A

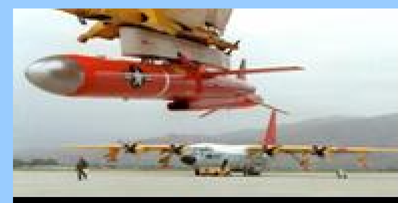
AQM-37C

MSST
(development)

Full Scale & Subsonic

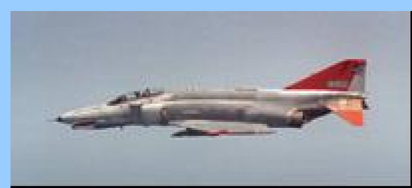


BQM-34S



BQM-74E

QF-4

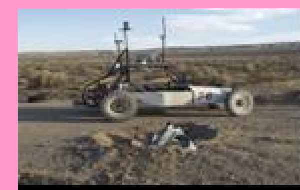


Decoys

TALD

ITALD

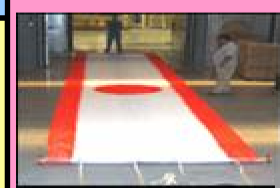
Miscellaneous



QLT-1C

COMMON TA / AS

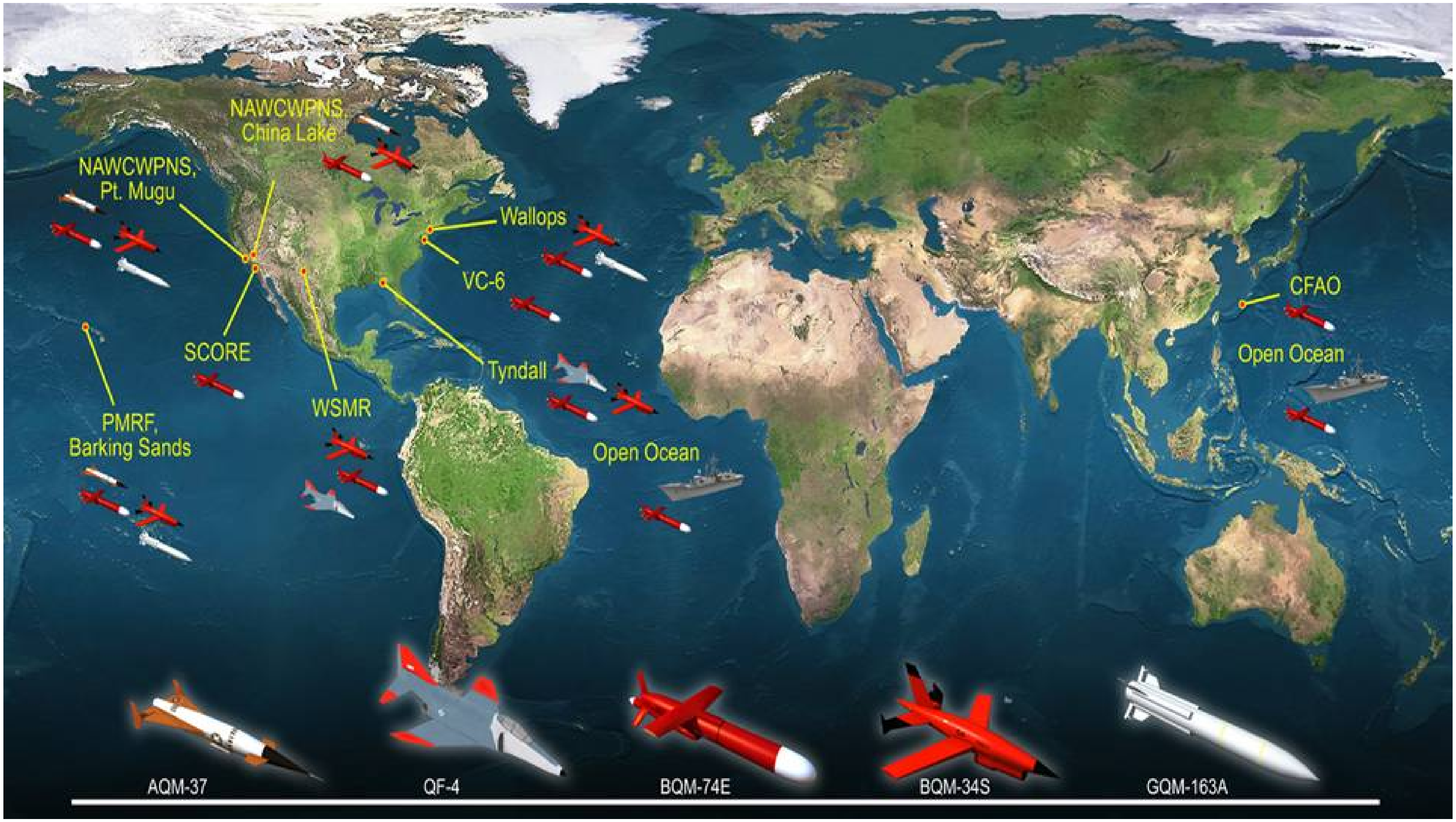
THREAT SIMULATION



TDU-32

SNTC

Operating Sites



- **VC-6 decommissioned**
- **NAVAIR conducting East Coast ops**

GQM-163A Supersonic Sea Skimming Target

Supersonic Targets

Requirement Drivers

- Sea Skimming Supersonic Target
- High-Diver Supersonic Target
- Multi-Stage Supersonic Target

GQM-163A Program Status

- Prime Contractor: Orbital Sciences Corporation
- Operations to date (5):
  - 6 October 2005 (1)
  - 12-13 June 2007 (2)
  - 12 December 2007 (2-stream raid)

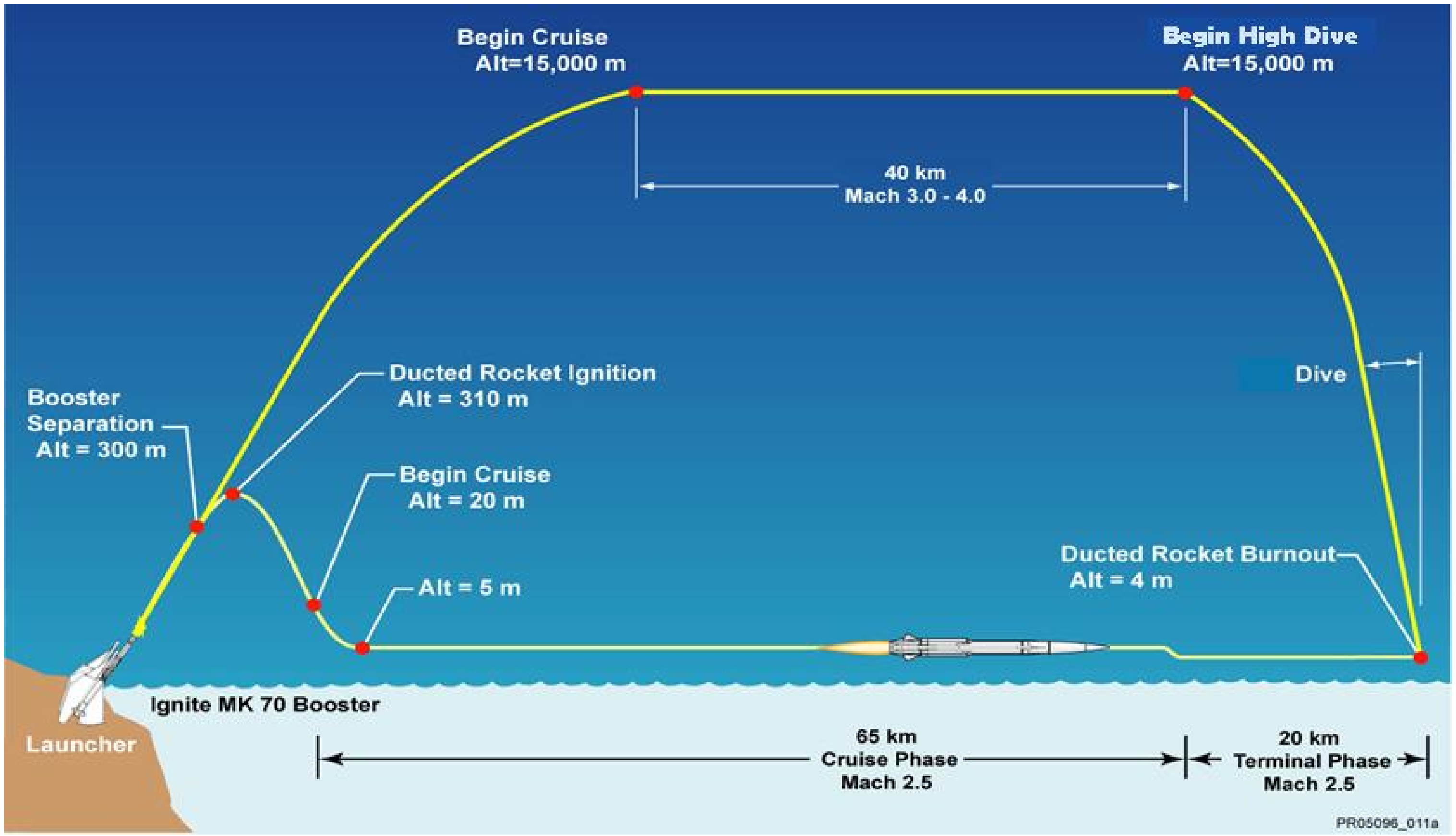
  *** Next operation anticipated December 2008 (stream raid)
- Developing augmentation to current flight termination system

GQM-163A meets all Supersonic Sea Skimming T&E requirements

MA-31 – Program Closure

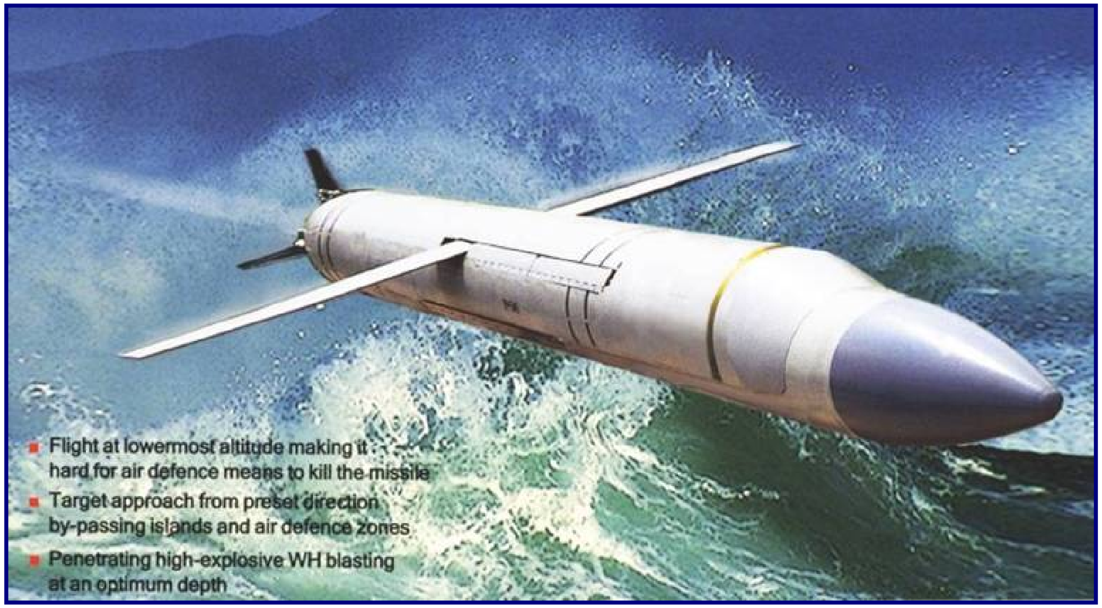
- Conducted Joint Navy (LPD-18) & Army (Patriot) operation in December 2007 at Pt. Mugu range with last remaining assets
  - Program stood down

GQM-163A
High Diver Demonstration



- **High Diver demonstration initiated in March 2006**
- **Demo planned for 3rd quarter FY-09**
- **Sponsors working to document long term requirements**

Multi-Stage Supersonic Target (MSST)



- The MSST's purpose is to emulate advanced two-stage ASCMs in support of Air Defense Weapons/Combat Systems T&E events, to include:
  - AEGIS CG Mods, AEGIS DDG Mods, LHA-6, DDG-1000, CVN-21, SSDS, CIWS, RAM Blk 2, SM-6 ERAM, ESSM, SM-2, and JSF

MSST will satisfy requirements of the Threat-D Target System CDD

Threat D - Multi-Stage Supersonic Target

- Acquisition (ACAT IV-M) – PEO(U&W) MDA
  - *Draft RFP posted & Industry Day held in July 2007*
  - Request For Proposal (RFP) released November 2007
  - Proposals received in February 2008
  - Milestone B & SDD contract award made in August 2008
  - Contract award was protested and is under GAO review. Anticipate GAO decision no later than December 2008.

- SDD effort will lead to follow-on contract for Low Rate Initial Production and Full Rate Production

- Initial Operational Capability planned for FY14

AQM-37

- **Medium to high altitude supersonic cruise with dive capability**
  - Mach 2.0 – 4.0
  - Range 100 mi
  - Altitude 1000 ft – 100 Kft
  - Demonstrated TBM profiles (300 Kft, 120 nmi downrange)
  - F-16 launch platform

- **Out of production system**
  - Last Delivery Dec 2001

- **Historically have conducted approximately 10-15 operations per year (~ half FMS)**

- **Low fidelity high-diver**

Subsonic Targets

Requirement Drivers

- High fidelity Subsonic Target
- Special configuration Subsonic Targets

BQM-74E

- **Production**
  - Training and T&E workhorse
  - Final procurement planned FY09
- **Missions:**
  - High fidelity Anti-Ship Cruise Missile (ASCM) Surrogate
  - Low-fidelity A/C simulator
    - Altitude: 7 ft – 40 Kft
    - Endurance: 68 min
    - Ground Launch; Shipboard Launch;
    - Air Launch: C-130, Gulfstream, F-16
- **Product improvements**
  - Programmable semi-autonomous waypoint navigation
    - Selectable Lost Carrier Sensitivity from waypoint to waypoint
    - Return to Recovery Area
    - FY10 fielding planned
- **Prime contractor – Northrop Grumman**

Current Inventory ~ 267
FY06 Ops/Expenditures – 235/62
FY07 Ops/Expenditures – 158/52
FY08 Ops/Expenditures – 220/66

Target does not adequately represent many key characteristics of today's threat ASCMs

Alternative Subsonic Flight Demonstration

- Navy strategy to verify wider range of potential subsonic targets that could potentially fulfill Navy needs
- Composite Engineering, Inc. (CEi) of Sacramento, CA flew first demonstration in September 2007
  - Design based on Air Force BQM-167A
  - Five flight demonstrations completed
    - Last flight completed on 20 February 2008
- Successful demonstration program was key enabler to support full and open competition strategy for the next generation Subsonic Aerial Target (SSAT)

Subsonic Aerial Target (SSAT) Requirements

- ONI threat assessment update performed
- Weapons Systems Sensitivity Study completed by Johns Hopkins University Applied Physics Laboratory
  - Determined that existing Navy subsonic targets could not be modified to achieve needed performance attributes
- Navy requirements sponsor leading CDD requirements working group
  - CDD in formal staffing
  - Planning for a final CDD to be signed in Nov 08

Subsonic Aerial Target (SSAT) Acquisition Approach

- Strategy is to have industry modify an existing subsonic target to achieve Navy SSAT requirements
  - Estimating an ~24 month late stage System Development & Demonstration (SDD) effort
- RFI released to gain insight into industry perspective
  - SDD: time needed, cost ROM & technical drivers
- 21 October 2008 Industry Day
- Draft RFP planned for release prior to Industry Day
- Final SDD RFP planned for release in late Nov 08 to support 3rd quarter FY09 ACAT IV(M) Milestone B and contract award
  - Dependent on CDD approval and cost affordability analysis
- Planning for two priced production options & contractor logistics support option on development contract

BQM-34S

- **Sustainment**
  - Maintain required inventory
- **Missions**
  - Low fidelity A/C simulator
  - T&E workhorse – special configurations
    - Open Loop Seeker (OLS) integration
- **Product Improvements**
  - UIAU integration:
    - Replace existing autopilots with UIAU from BQM-74
    - Common avionics, radar altimeter, Support Equipment with current production BQM-74E
    - Address obsolescence issues
    - Reduced logistics
    - Allows for performance growth if required
    - 25 retrofits planned to support expected OPTEMPO
- **Prime contractor – Northrop Grumman**

Current Inventory ~ 200
FY06 Ops/Expenditures – 19/2
FY07 Ops/Expenditures – 14/3
FY08 Ops/Expenditures – 12/0

Target does not adequately represent many key characteristics of today's threat ASCMs

Full Scale Targets

<u>Requirement Drivers</u>

- High fidelity 4th & 5th Generation Aerial Targets
- Moving Land Targets
- UAV Targets

Full Scale QF-4/QF-16

- QF-4 - Air force led program
  - Operating at Tyndall & White Sands Test Ranges
  - Air Force existing contract runs thru Lot 15 (FY09)
    - Navy procured five in FY08 & Plans to procure five in FY09
  - Air force plans to award new contract for two lots in FY-10 & FY11
  - Last deliveries in FY13 from procurements in FY-11

- AST QF-16 Air force led program
  - Replacement for the QF-4
  - Navy providing requirements inputs and RDT&E funding to Air force
  - Navy to participate in TEMP development and Source Selection
  - IOC 3QFY15
  - ~15 years of production at 25 A/C per year

Navy Moving Land Target (MLT)

- MLT program transferred from PMA-205 to PMA-208 2007
- Navy identified need for a threat representative training MLT to replace QLT-1C
- Navy leveraged the Shootable Remote Threat Ground Target (SRTGT) OSD T&E demonstration initiative to identify a potential baseline configuration to to support acquisition of a training MLT
- PMA-208 recommended the current requirements document be reviewed to update evolving training requirements and to include T&E needs
  - Necessary to preclude requirements creep

Acquisition plans on hold pending update of Navy MLT requirements

MLT Acquisition Approach

- FY08 Activity
  - Risk Mitigation: Using existing funding to procure additional SRTGTs through China Lake to support initial Fallon and Yuma training needs while requirements are refined
    - Gives T&E & Training Target Sponsors a chance to synchronize efforts

- Ongoing requirements analysis to capture training and T&E needs
  - Needed to support acquisition efforts
  - Planning for requirements to be documented in early FY-09

- Planning for FY09 full and open competition for MLT
  - Possible strategy:
    - Procure training variant
      - Provide contractual options for enhanced equipment procurement to meet T&E requirements

      \- or-

      - Government modifies/augments vehicles as needed to support T&E needs

Planning to release a draft RFP prior to an Industry Day to b e held in early 2009

Target Control System

System for Naval Target Control
UHF 360 – 380 MHz

Current: SNTC System

- COTS Product (Micro Systems, Inc)
- UHF 435–450 MHz
- Controls BQM-74/34 aerial targets as well as HSMST and QST-35 seaborne targets
- Low transponder cost
- 200 nmi line of sight
- 330 nmi via Relay
- Supports Training and T&E

Near Term: SNTC System UHF 360-380 MHz Modification

- Currently constrained as a “Secondary User” on a not to interfere basis
- Frequency shift will result in “Primary User” status in a military designated frequency band limiting the possibility of interference and target loss
- New frequency assignment will allow for future growth in bandwidth
- All original capabilities retained.

Requirements analysis effort initiated to document long term target control needs

Target System Challenges

Evolution of the threats

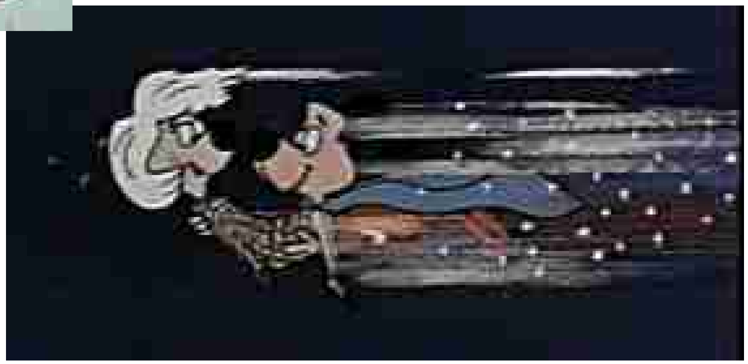
- Supersonic dive
- Anti-ship ballistic cruise missile
- Asymmetric threats
- Enhanced threat capability
- Stealth
- Scramjet . . . *Mach 5 and beyond*

Programmatic

- Meeting evolving requirements - more extensive and accurate representation of threat
- Reconfiguration, reuse, and versatility
- Cost control – acquisition & operations
- Obsolescence
- Inventory management

Targets . . . Often the Underdog . . .

The threats will continue to evolve. The Navy Target Team will continue to work with all stakeholders and our Industry partners to provide required threat representations to meet the needs of developmental testing, operational evaluation and Fleet training.



A critical enabler to the successful development & fielding of future Naval combatants and their associated defensive weapons systems . . .

"Just Targets"

Targets, Ranges and UAVs: An Operational Test Perspective

Mr. Mike Crisp
DOT&E

10/9/2008

DOT&E Charter

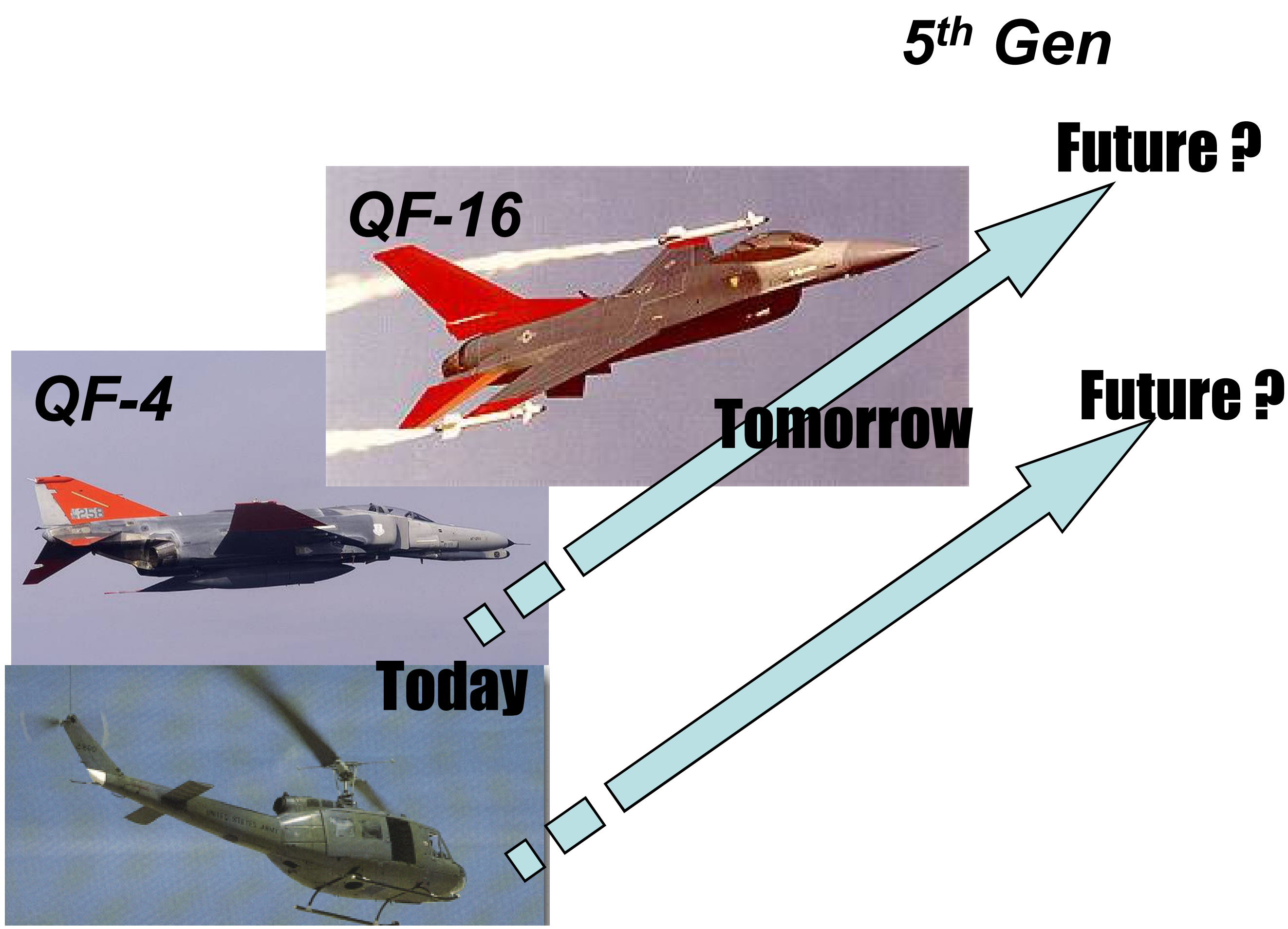
- Title X, Sec.2399. Para (b) Operational Test and Evaluation.
  - (1) Operational testing of a major defense acquisition program may not be conducted until the Director of Operational Test and Evaluation of the Department of Defense **approves (in writing) the adequacy of the plans (including the projected level of funding) for operational test and evaluation to be conducted in connection with that program.**
  - (2) The Director shall analyze the results of the operational test and evaluation conducted for each major defense acquisition program. At the conclusion of such testing, the Director shall prepare a report stating—
    - **‘‘(A) the opinion of the Director as to—‘‘(i) whether the test and evaluation performed were adequate; and ‘‘(ii) whether the results of such test and evaluation confirm that the items or components actually tested are effective and suitable for combat; and**
    - **‘‘(B) additional information on the operational capabilities of the items or components that the Director considers appropriate based on the testing conducted.’’**

DOT&E approves the OT&E plans which identifies the test resources (i.e., targets and ranges) for all programs on OSD oversight.

Missile Targets

End to End Testing is Necessary – "Test Like You Fight"

Full Scale Aerial Targets



Cruise Missile Targets (Subscale Subsonic)

- Air Force - BQM-167A
- Army - MQM-107

- Navy – Venerable BQM-74E

What will be the future Navy ASCM target?

- *BQM-74F*
- *BQM-167 Variant*
- *Something else?*

Mobile Ground Targets

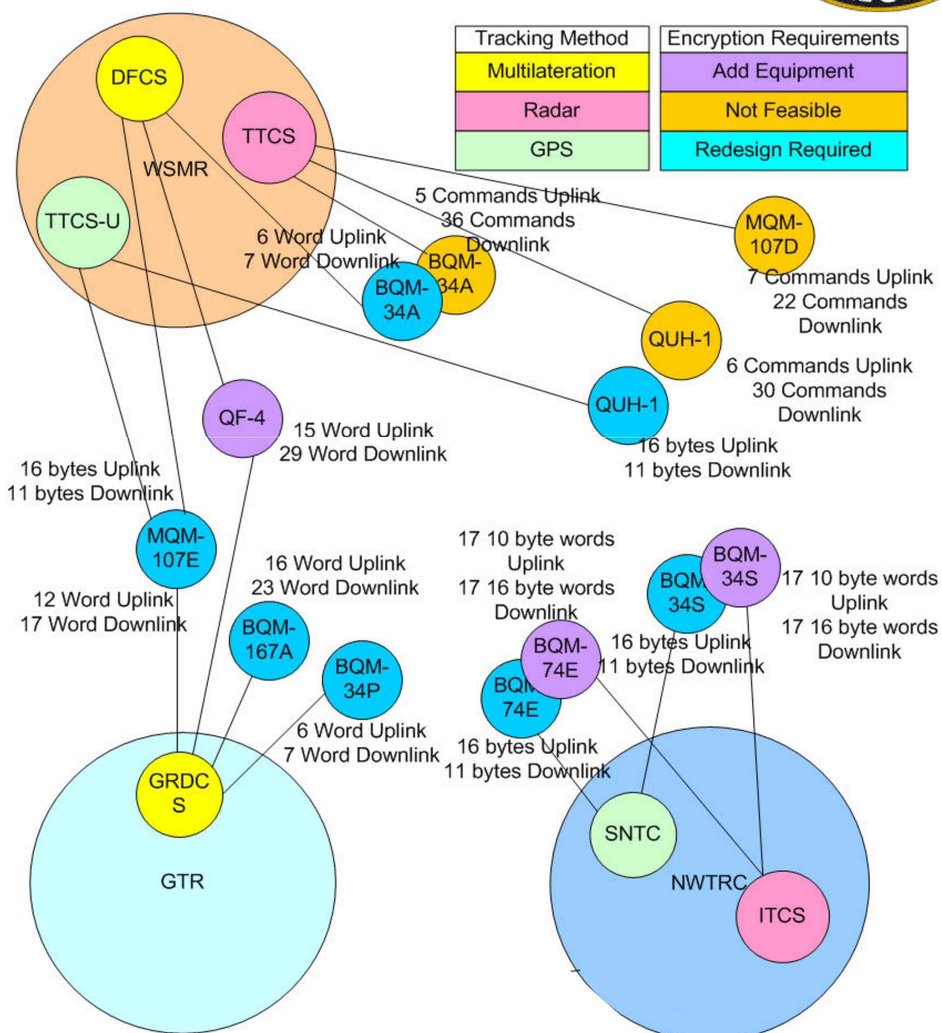
- **It's About Representing The Threat**

- **It's About Test and Training**
- **And It's About Cost**

Target Control

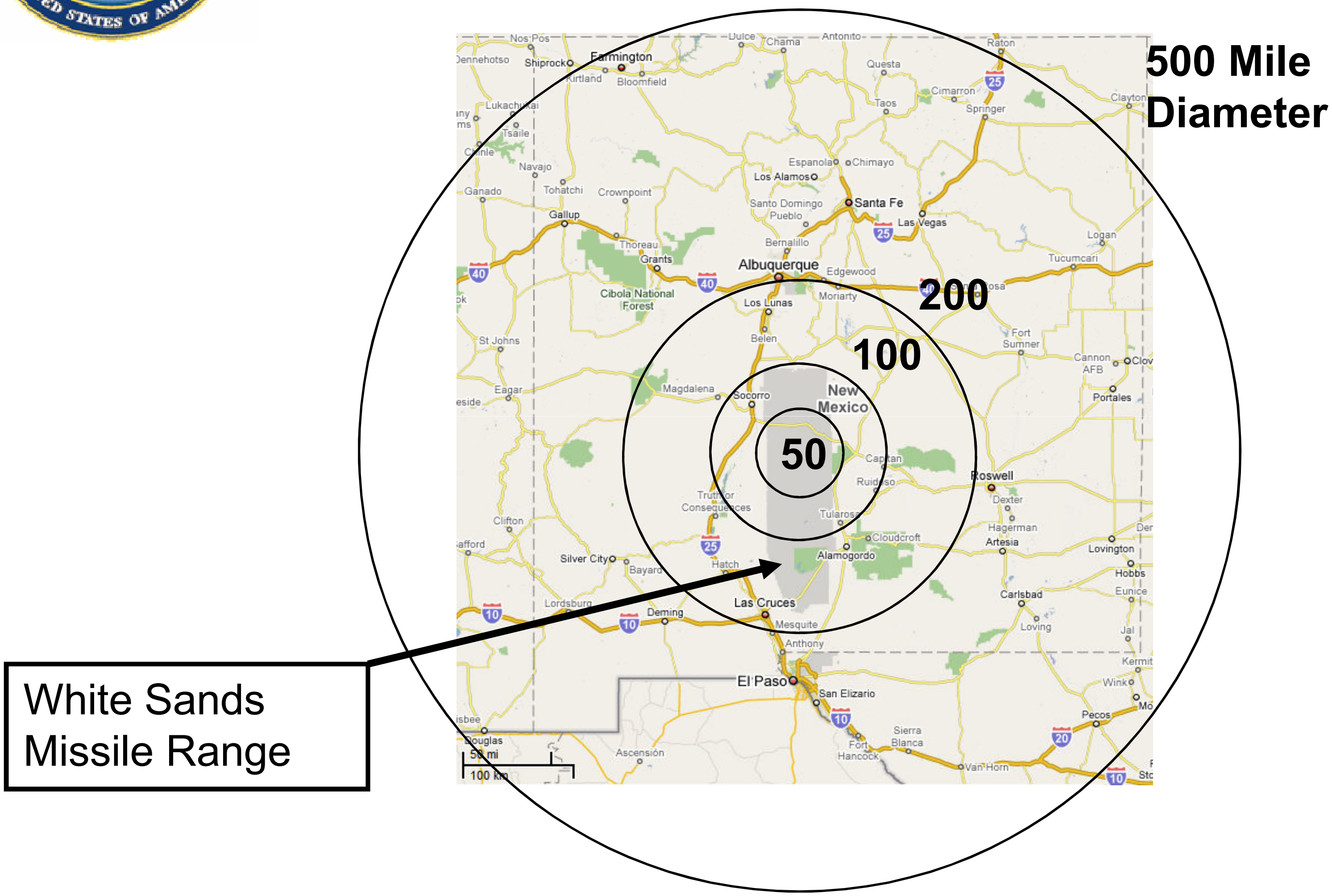
- The 2005 DSB Task Force on Aerial Targets envisions the gradual introduction of common control elements that would eventually provide us with the ability to “shoot any target on any range.”

- We need a corporate approach towards open architectures and standards based development



This is not a technical problem but more so a cultural problem

Ranges



- FOOT PRINT
- SPECTRUM
- AGING INFRASTRUCTURE
- ENCROACHMENT

Unmanned Air Systems

- **Perspectives:**
  - ACTD legacy
  - Dual-program problem
  - Limited meaningful testing
  - Performance

Unmanned Air Systems

- **<u>What should be done now?</u>**
  - Fielded systems: Invest in reliability growth and improvements to suitability
  - Systems under development: Accomplish the fundamentals necessary for a successful program
  - Realistic DT/OT: Change the paradigm that “UAS’s are just unmanned systems”

Summary

- UAS's are a paradigm shift in how we need to test.
- Expand the capability and flexibilty of the range
- Targets must focus on representing the threat for its intended use (Training, DT, OT)

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Land Warfare Systems
Expeditionary Warfare System
Future Combat Systems
Battle Command
Land Munitions
Rotary & Tilt-Rotor Aircraft
Tactical UAV
Chem-Bio Defense Program

Joint Rapid Acquisition Cell
Integrated Resource Analysis
T&E Threat Resource Activity
Joint Test Board

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Strategic Air Combat Systems
Aircraft Carriers
Air Launched Munitions
Endurance UAVs
Air Warfare C4ISR Systems
IR/UV/RF Def Combat Sys
Airlift Systems

Joint T&E Program
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Surface Ships
Submarines & UUVs
Navy Combat Systems
- Radars
- Sonars
- EW System
- CEC

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- Guided Projectiles
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Live Fire – Land, Air, Naval
Lethality & Survivability

Joint IED Defeat
Joint Live Fire Program
Joint Aircraft Survivability
Joint Technical Coordinating Group-Munitions Effectiveness

Air Force Flight Test Center

War-Winning Capabilities … On Time, On Cost

AD INEXPLORATA

Test like you Train…Train like you Fight

How Today's Complexity Drives Future Range Requirements

Major General David J. Eichhorn
AFFTC Commander

30 Oct 2008

This Briefing is:
UNCLASSIFIED

Testers exert huge (often unseen) influence over weapon systems

The Truth

Testers exert huge (often unseen) influence over weapon systems

Overview

- Systems Under Test
- Future Systems
- Range Constraints
- Challenges
- Limitations
- Opportunities

Testers exert huge (often unseen) influence over weapon systems

CSAF's Guidance

- Commitment
  - Renew the AF's support to important mission areas
- "Top Acquisition Priorities"
  - Expand UAV efforts
- Training
  - Increase UAV pilots to 1100 by 2009
  - 100 TPS Graduates will be assigned to UAVs

No Modern War Has Been Won Without Air Superiority……No Future War Will Be Won Without Air, Space, and Cyberspace

AFFTC Systems Under Test

- Hypersonics

FAST

X-51

X-37B

- Unmanned Aerial Systems

UCAV

RQ-4B

MQ-9

Testers exert huge (often unseen) influence over weapon systems

X-37B
Orbital Test Vehicle

- Cape Canaveral launch onboard a 501 version of the Atlas 5 rocket
- Five-meter payload fairing enclosing the spacecraft and the Centaur upper stage
- Re-entry and conventional landing at
  Vandenberg – alt Edwards - 2009

Testers exert huge (often unseen) influence over weapon systems

FALCON Blackswift
Global Reach

- Reusable Hypersonic Cruise Vehicle (HCV)
- Delivering 12,000 pounds of payload at a distance of 9,000 nautical miles from CONUS in less than two hours
- Mach 6 study
  - Horizontal takeoff and landing – 2011

Testers exert huge (often unseen) influence over weapon systems

X-51A Scramjet Engine Demonstration

- Mach 4-5 - 2008
    - Loaded onto a B-52 Stratofortress
    - Boosted by an Army Tactical Cruise Missile
    - Release altitude 50,000 feet and will soar at hypersonic speed
    - Pt Mugu ocean impact
- Mach 6-7 - 2009
    - Cruise endothermic hydrocarbon fueled
- Environmental assessment underway

Testers exert huge (often unseen) influence over weapon systems

Global Hawk Block 20

•Certification of RQ4B Block 20 variant with EO/IR/SAR sensor suite tested at Benfield Anechoic Facility - Jun 2008
•IOT&E – Aug/Sep 09

Testers exert huge (often unseen) influence over weapon systems

Block 30 Global Hawk Airborne Signals Intelligence Payload (ASIP)

- ASIP calibration on U-2 completed at Palmdale Mar 2008
- Global Hawk calibration of the ASIP sensor with the Enhanced Integrated Sensor Suite (EISS) testing underway

U2 Flying Test Bed

Testers exert huge (often unseen) influence over weapon systems

Global Hawk Block 40 Multi-Platform Radar Technology Insertion Program (MP-RTIP)

Proteus Flying Test Bed

- Operational Assessment – Mojave 2008
- Global Hawk air vehicle arrives 2009

Testers exert huge (often unseen) influence over weapon systems

Predator/Reaper

MQ-1 Predator

•**Combat Hours Flown:** 400,000+ **Inventory:** 10
•**Wingspan:** 48.7 feet (14.8 meters)
•**Maximum takeoff weight:** 2,250 pounds
•**Fuel Capacity:** 665 pounds (100 gallons)
•**Speed:** Cruise speed around 84 mph (70 knots), up to 135 mph
•**Range:** up to 400 nautical miles (454 miles)
•**Ceiling:** up to 25,000 feet (7,620 meters)
•**Stores**
  •2 laser-guided AGM-114 Hellfire anti-tank missiles

MQ-9 Reaper

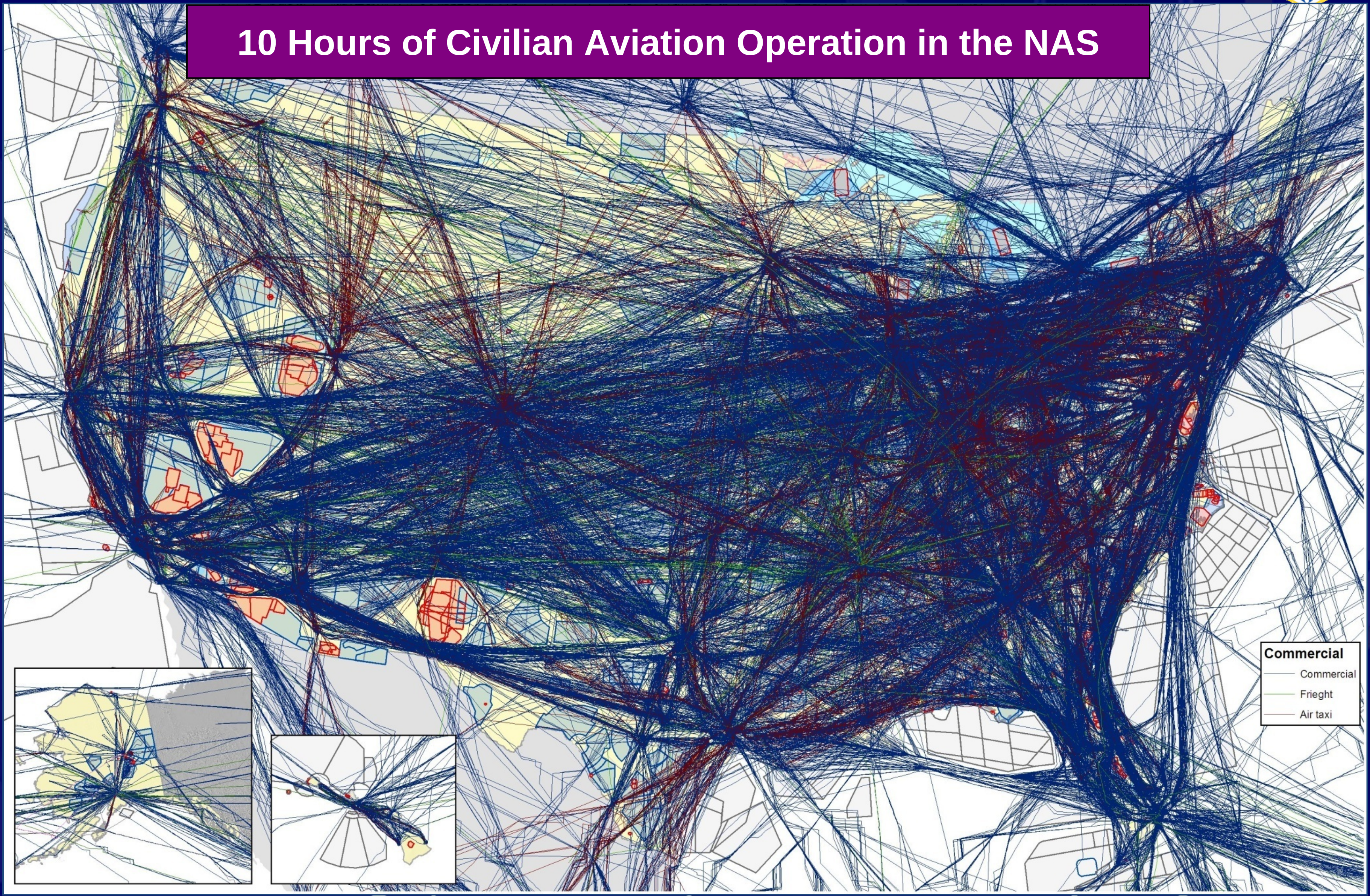
•**Combat Hours Flown:** 4,000 + **Inventory:** 110
•**Wingspan:** 66 feet (20.1 meters)
•**Maximum takeoff weight:** 10,500 pounds
•**Payload:** 3,750 pounds
•**Speed:** cruise speed around 230 miles per hour (200 knots)
•**Range:** 3,682 miles (3,200 nautical miles)
•**Ceiling:** up to 50,000 feet (15,240 meters)
•**Stores**
  •AGM-114 Hellfire missiles
  • GBU-12 Paveway II
  •GBU-38 Joint Direct Attack Munitions

Testers exert huge (often unseen) influence over weapon systems

Challenges

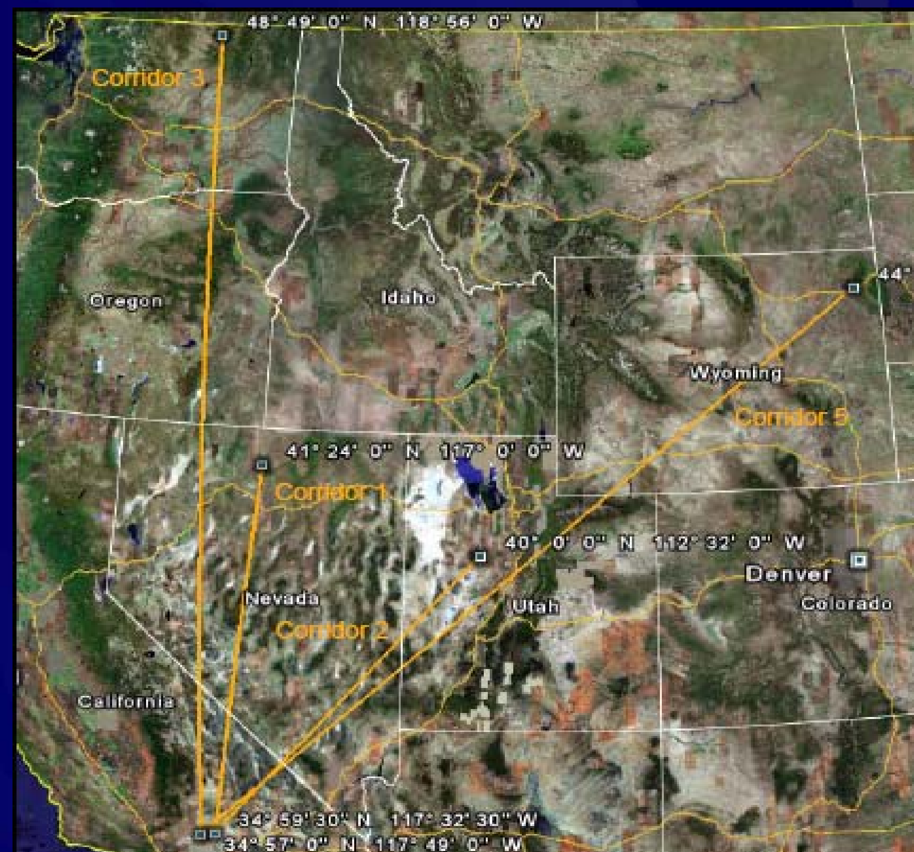
- Operating Environment
  - National Airspace System (NAS)
  - Sense & Avoid (SAA)
  - Controlled Airspaces Limits Available Footprint
  - Enhanced Flight Termination System (EFTS)
  - Space based FTS
- Test Readiness
  - Environmental Assessments (EA)
  - Failure Modes and Effects Analysis (FMEA)
  - Risk Assessment

Range Constraints Today



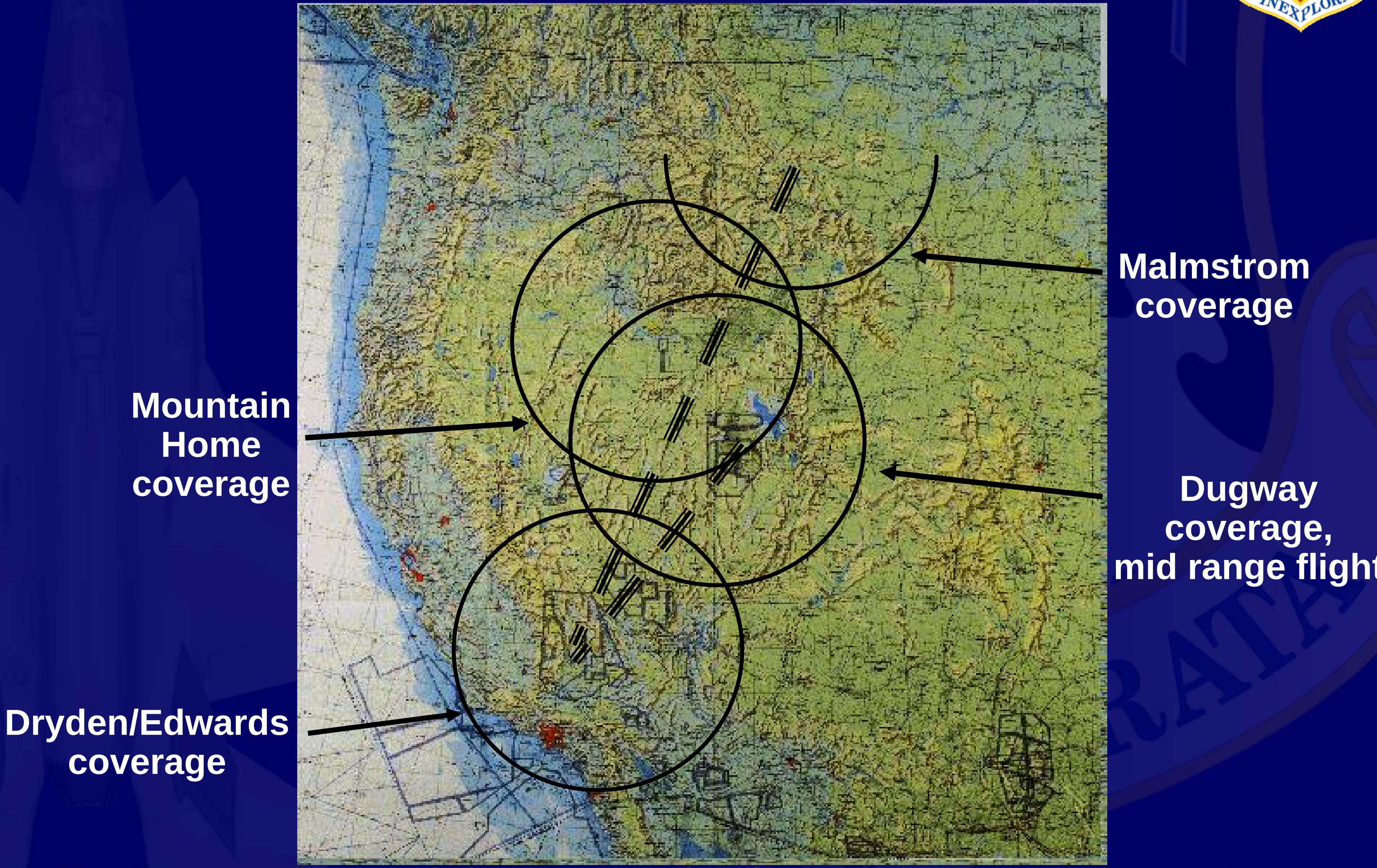
Success – Hypersonic Corridors Defined

- EA for Corridors for X-43B being used for test concept planning for Ground Takeoff Mach 6 Blackswift Vehicle (400 and 825 nm corridors)



Testers exert huge (often unseen) influence over weapon systems

Success – Corridor for X-33 Defined



Testers exert huge (often unseen) influence over weapon systems

Flight Test to the Edge of Space Area

Testers exert huge (often unseen) influence over weapon systems

Test Readiness

- Environmental Assessment
  - Impact to Air Quality
  - Noise (mostly sonic booms)
  - Commercial Air Traffic
  - And more
- Risk Assessment
  - Risk to uninvolved public must be acceptable
  - Function of population, flight trajectory, vehicle size and breakup
  - Impacts where to fly and flight test concept
  - Public safety responsibility rests with the Range Commander

Testers exert huge (often unseen) influence over weapon systems

Test Readiness (Cont)

- Air Vehicle Stability & Control
  - Flight Termination System
  - Situation Awareness assessment data from two independent sources
- Failure Modes and Effects Analysis (Contractor Deliverable)
  "*Potential harm or injury to the user of the end item being designed*"
- Types
  - System - focuses on global system functions
  - Design - focuses on components and subsystems
  - Process - focuses on manufacturing and assembly processes
  - Service - focuses on service functions
    - Software - focuses on software functions

Testers exert huge (often unseen) influence over weapon systems

Limitations

- Airspace Limitations
  - Tempo of UAV and Hypersonic testing will continue to increase exponentially in the coming years
- FAA Partnering
  - UAV & Hypersonic testing/deployments in the NAS under current conditions requires FAA either Temporary Flight Restriction (TFR) or Certificate of Authorization (COA) Waiver
  - FAA has not codified “standard” for UAV and Hypersonic flight operating in the national airspace (NAS) – platform dependant
- Range Infrastructure
  - FTS EFTS & Space Based FTS immature
  - Cognitive learning technologies need to be developed

Limitations (Cont)

- SAA, Auto Direct Surveillance Beacon (ADS-B) & TCAS
  - Traffic Collision Avoidance System (TCAS) maturation in early development
  - Costs to retrofit existing air vehicles with SAA/TCAS potentially significant

Testers exert huge (often unseen) influence over weapon systems

Opportunities

- SAA, ADS-B, & TCAS technologies
- Accelerate autonomous collision avoidance capabilities in both cooperative and non-cooperative air traffic needs to be developed
- Solution needs to be affordable and portable across multiple UAS platforms
- Develop robust risk assessment/containment tools to
– Destruct lines, glide footprint, impact prediction tools
– Partner with FAA for re-consideration of current operational guidance
– Increase number of launch and recovery sites

Testers exert huge (often unseen) influence over weapon systems

Testers exert huge (often unseen) influence over weapon systems

Telemetry of the Future

...and the future is not too far off!

Thomas Grace
TAS Chief Engineer
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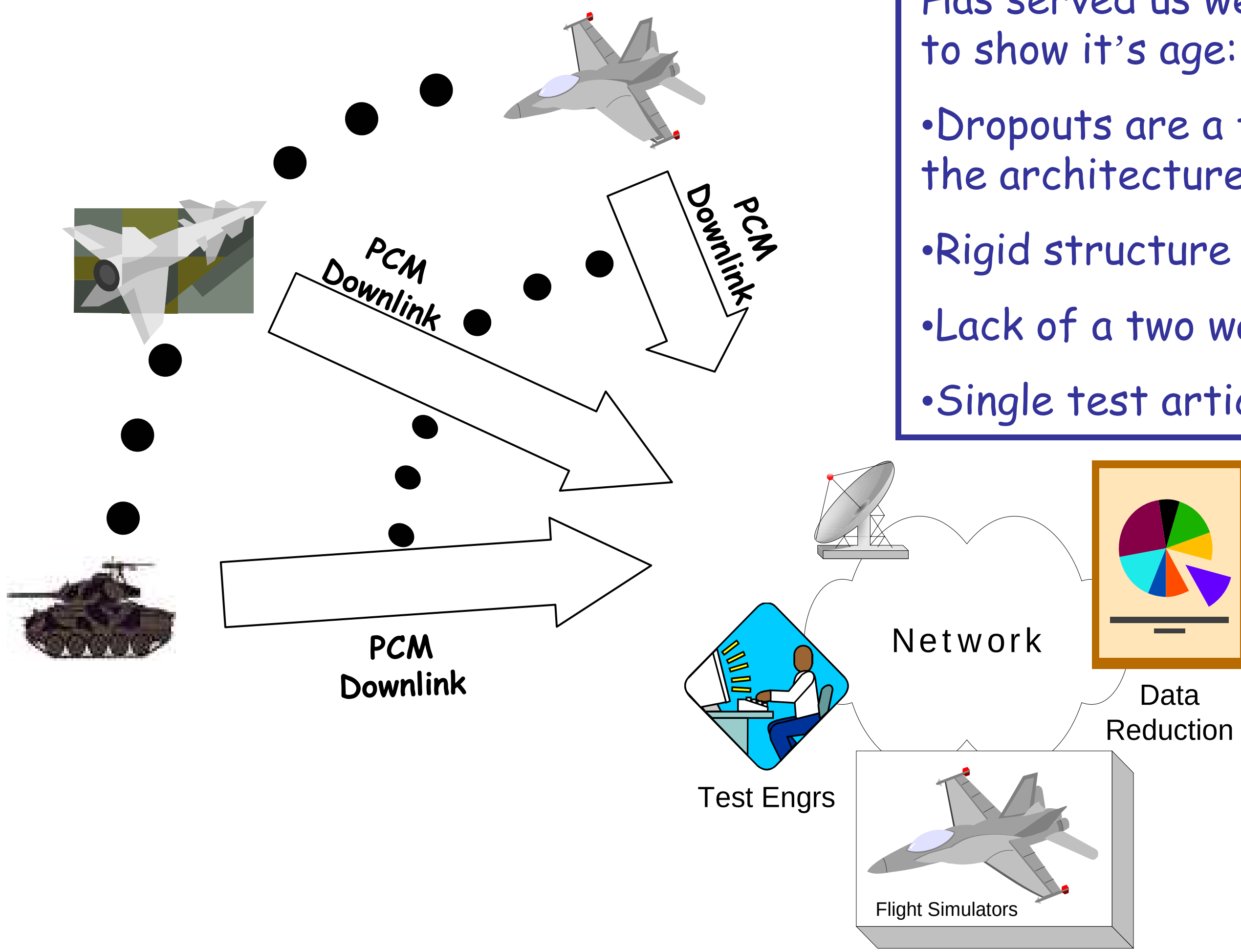
301-342-1227

50 Years of Service



Has served us well but it is starting to show it's age:

- Dropouts are a fundamental flaw of the architecture
- Rigid structure lacks flexibility
- Lack of a two way link limits options
- Single test article focused

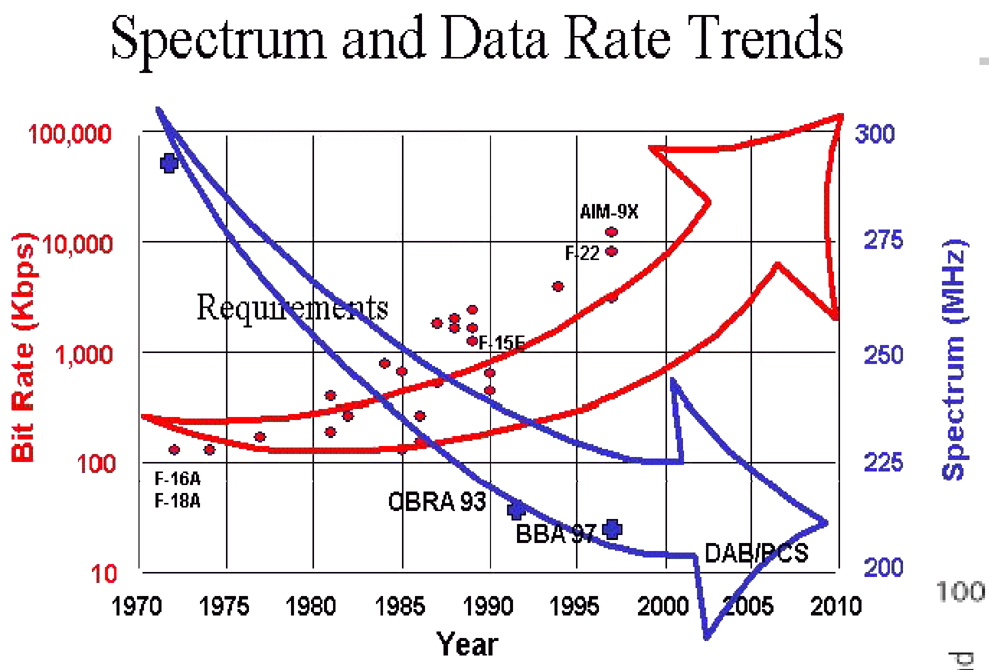
A Great Ride ...

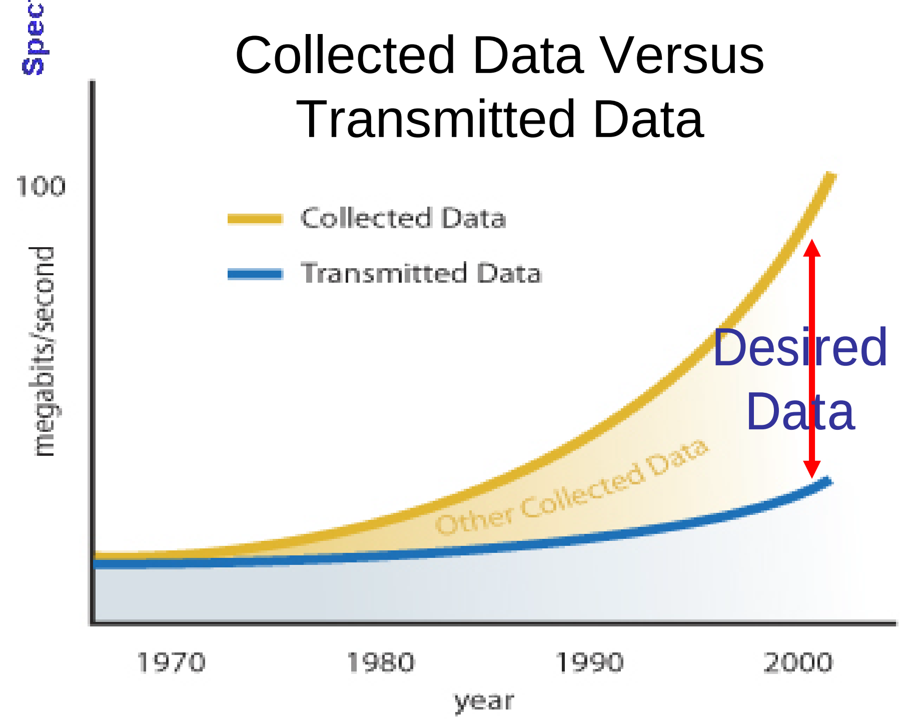
- In 1960 IRIG 106 Chapter 4 was published
  - 3 pages in length
  - Ushered in the era of PCM Telemetry
- 48 years later Chapter 4 is still being used
- Virtually every major weapons system in use today was tested using Chapter 4

However, in the late 1990s it began to show it’s age

Background

Disturbing Trends



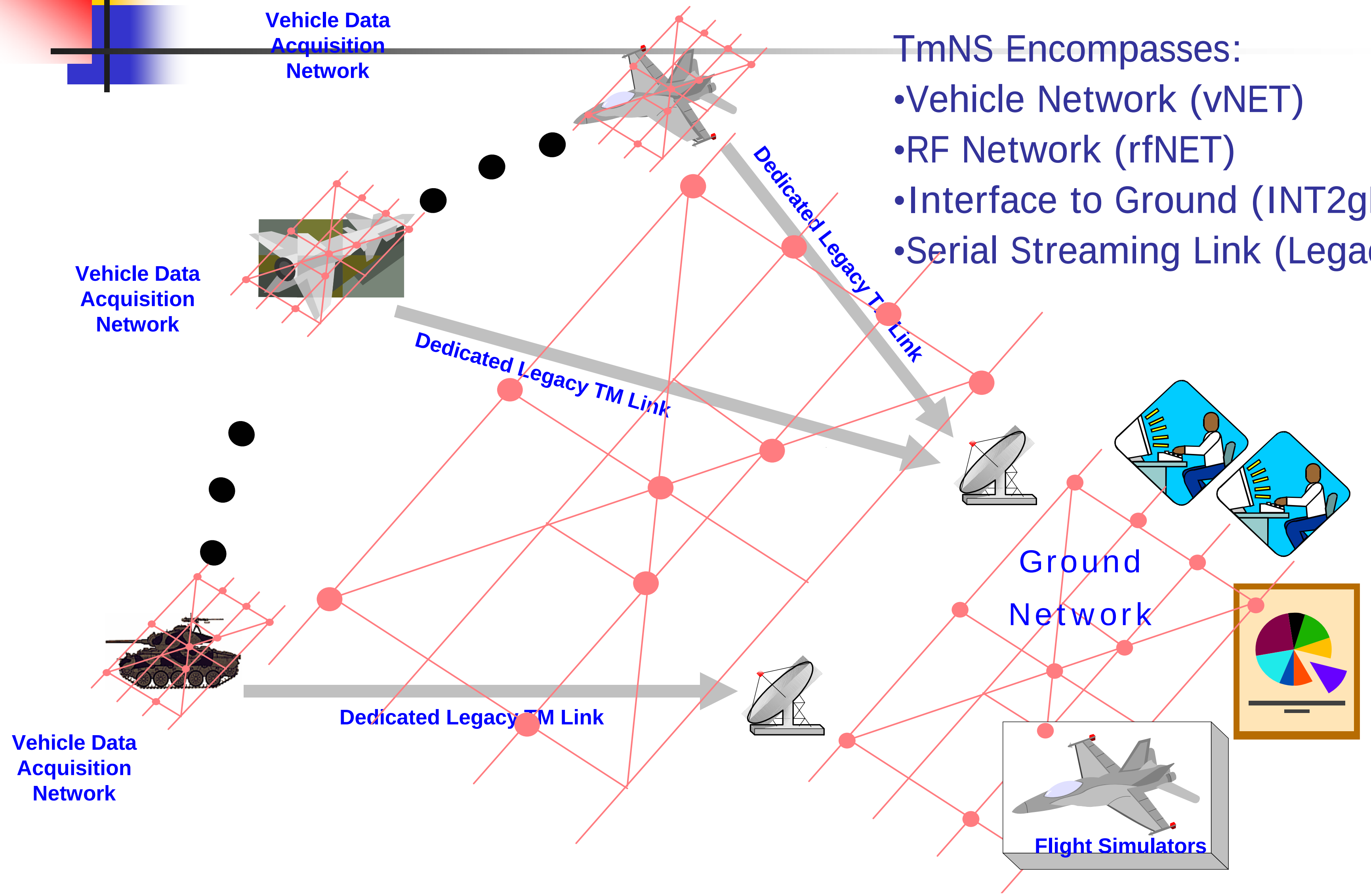


Rationale for Change

- Decrease time and cost associated with T&E
  - Reduce rework associated with:
    - Tm Dropouts , need to return to base to access data on onboard archive, etc.
- Provide flexibility to respond to future needs
  - Lack of two way connectivity limits flexibility.
- More Efficient Use of Spectrum
  - Real-time transmitter control, data set selection, etc...
- Leverage Sim/Stim capability with two-way connectivity to test article
- Leverage the Wireless Revolution
  - DoD and Private Sector are investing huge amounts of intellectual and financial capital in wireless networks

Telemetry Network System

TmNS Encompasses:
- •Vehicle Network (vNET)
- •RF Network (rfNET)
- •Interface to Ground (INT2gNET)
- •Serial Streaming Link (Legacy TM)



Laying the Foundation

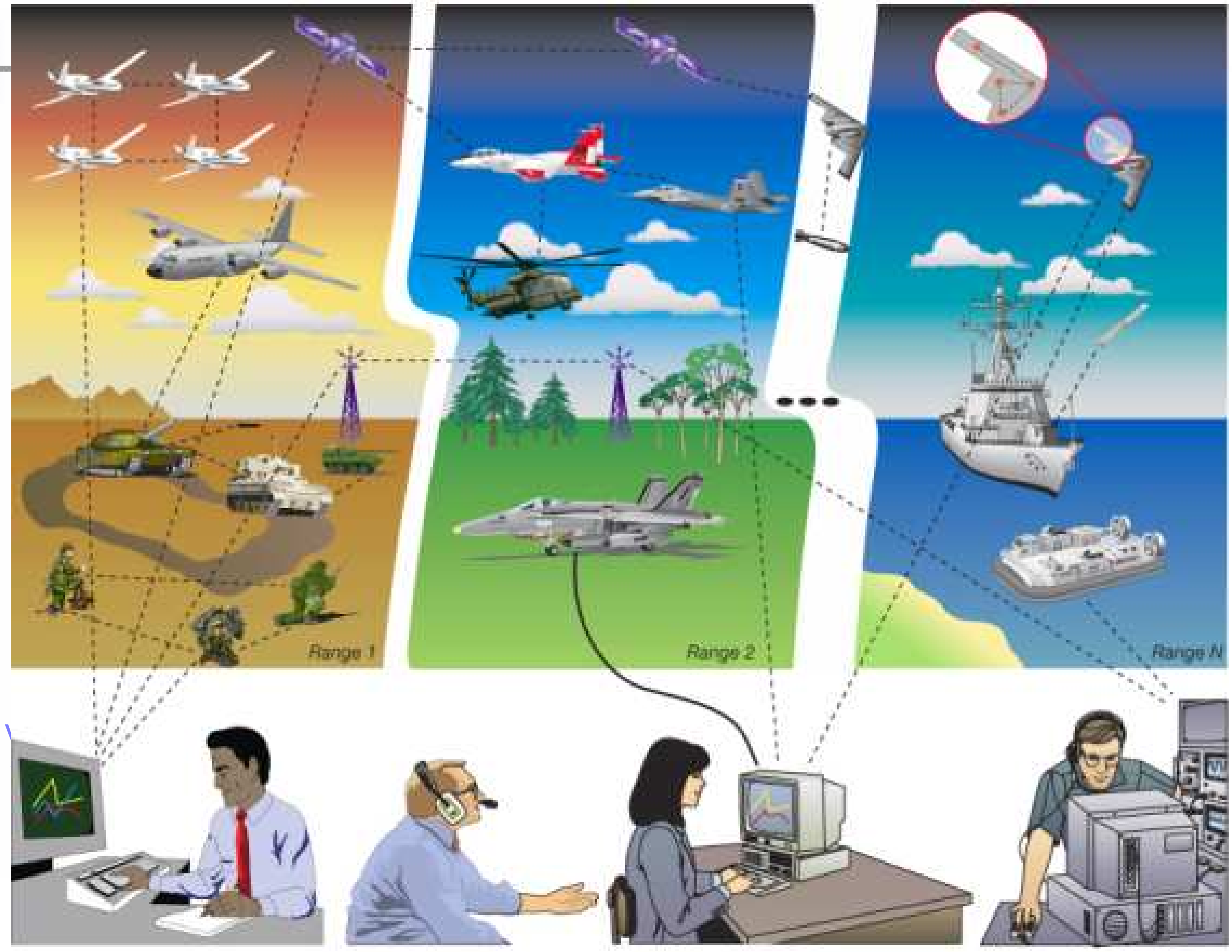
- Needs Discernment
  - What needs does this new architecture need to meet?
- Experimental Architecture
  - Can network enhancement of telemetry meet the needs?
- Technology Shortfalls
  - What technology gaps exist to deploying the experimental architecture?
- Investment Roadmap
  - Where does the sponsor need to invest to make iNET a reality?

The Needs Discernment is the cornerstone upon which the Architecture is built

Needs Discernment - Scenarios

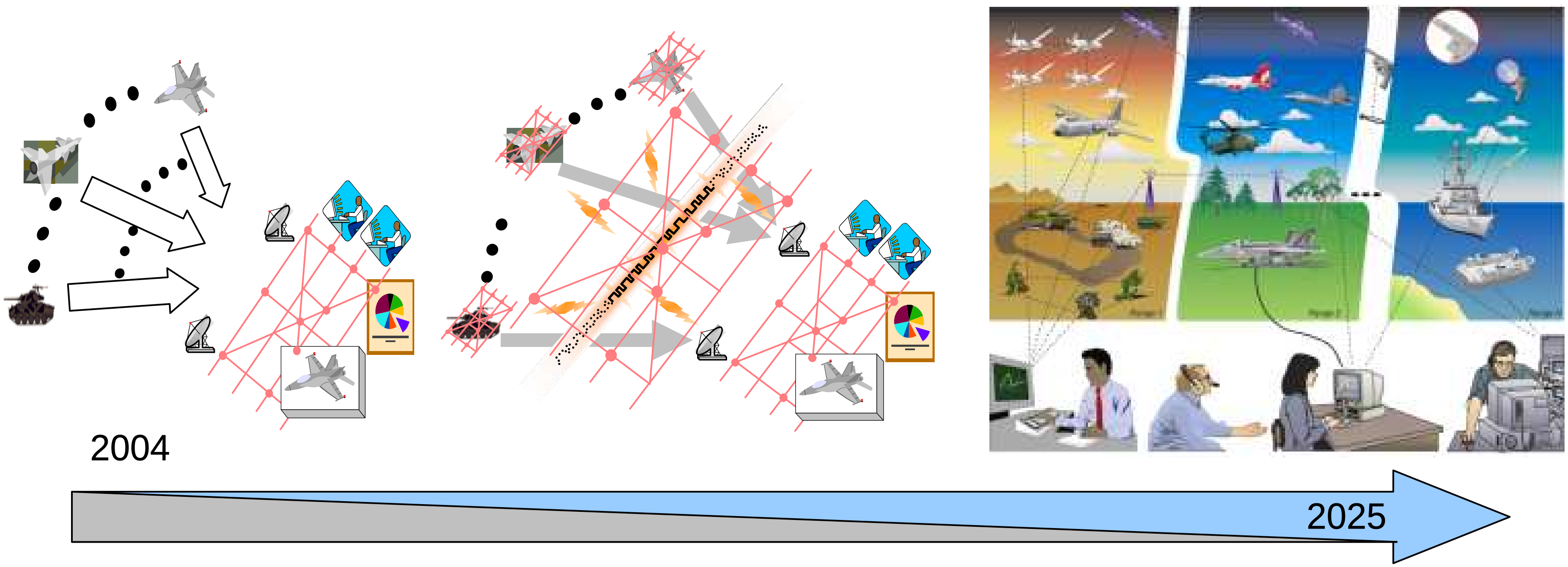
- 52 Test scenarios documented
  - Narrative descriptions of a wide range of test scenarios
    - Near-term to long-term, simple to exotic, etc...
    - Mostly targeted at the aeronautical environment
- Based on
  - Site visits to MRTFBs
    - EAFB, PMRF, Aberdeen, Eglin, Pax (and NASA Dryden)
      - Brainstorming sessions with test engineers, project managers, range folks, instrumentation folks, spectrum managers, etc....
  - Workshop (CTTRA)
    - Attended by 130 people
      - Virtually all MRTFB ranges were represented
- Validated by the private sector aviation industry
  - Aerospace and Flight Test Radio Coordinating Council (AFTRCC) reviewed scenarios
    - Added one and endorsed them as describing their future needs!

Extensive Network Connectivity



Long-term Vision: Near-term Results

Today | **iNET Project Fielded Capability** | **Long-term Vision**



Vision is achieved through Block Releases of the Architecture

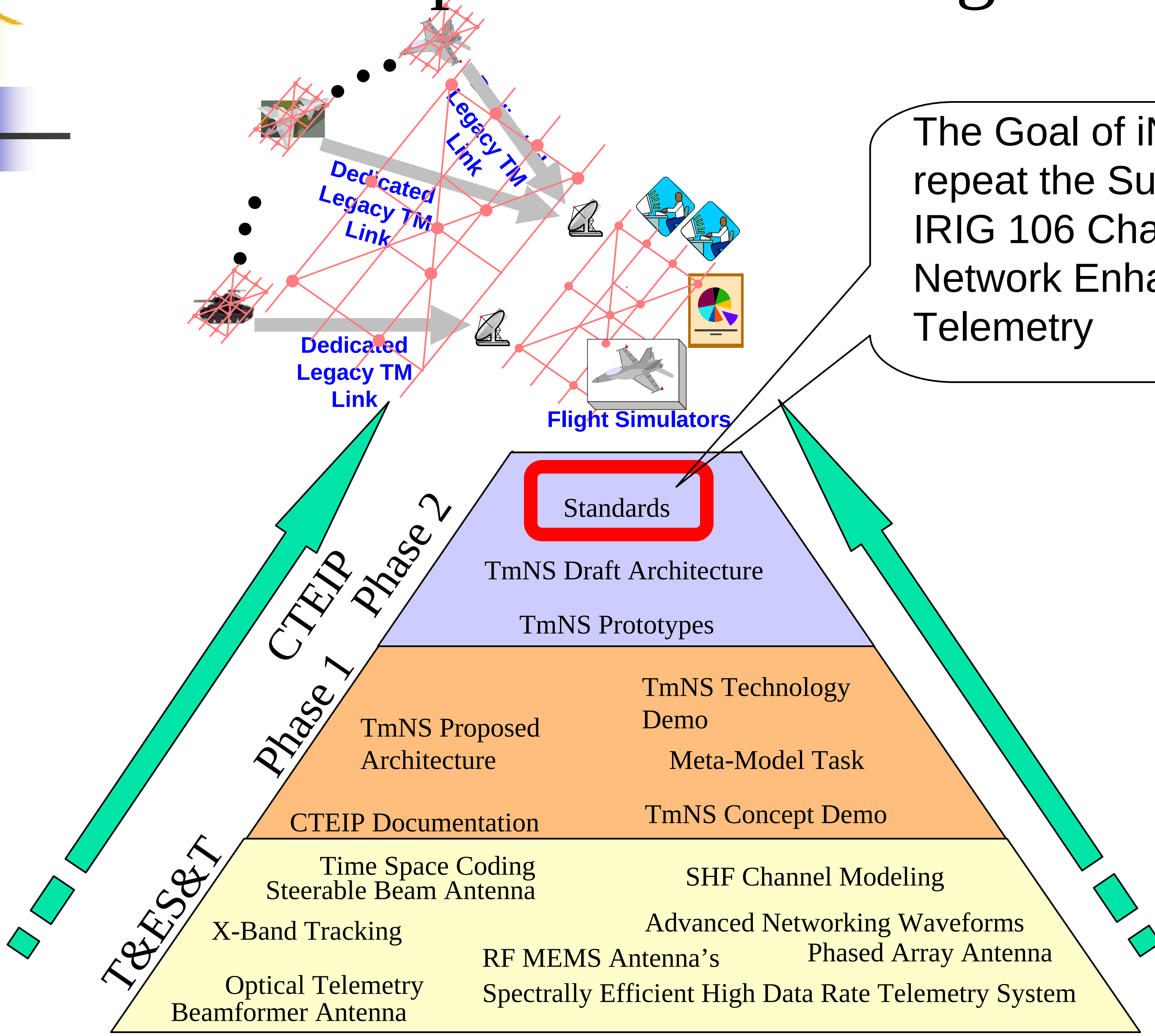
Block 1

Block 2

N greater than or equal to 3

Block N

A Complex Undertaking



The Goal of iNET is to repeat the Success of IRIG 106 Chapter 4 for Network Enhanced Telemetry

TmNS Architecture

- The Telemetry Network System (TmNS) Architecture is the core component of iNET
- Architecture is going through a 4 step maturation process
  - Experimental, Proposed, Draft and Final
- Proposed Architecture completed May, 2007
- Significant community review planned
  - Workshop (CTTRA)
    - June ‘07 in Virginia Beach
  - RCC (TG Meeting)
    - March ’07 at WSMR
- Community feedback will be incorporated
  - 75% Proposed architecture delivered in July, 2007

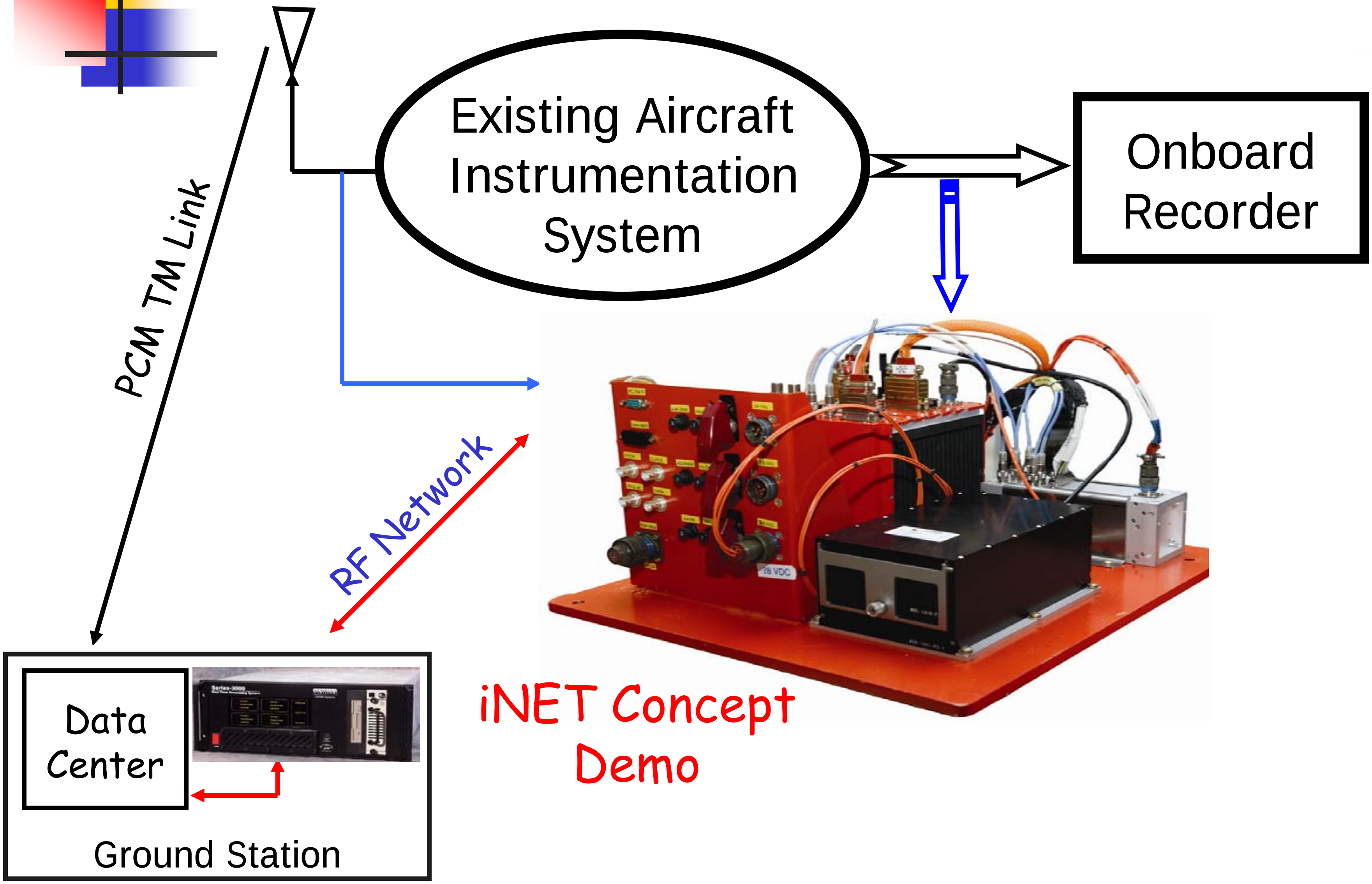
Architecture-Some Key Details

- Test Article Segment
  - Switched network architecture
  - Gigabit Ethernet
  - IEEE 1588 used for time correlation on vehicle
    - Achieving few hundred nanosecond time synchronization
  - Network link and PCM can use the same antenna!
- Ground Station Segment
  - Existing telemetry antennas can be upgraded
    - Used for network and PCM at same time
- RF Characteristics
  - TDMA over OFDM will be employed

Standards Work

- Working Groups
  - RF Communications Link
  - Test Article Network
  - Ground Station Applications
  - System Management
  - Metadata
- Architecture Refinement
  - Standard work being feedback
  - Process for tracking and addressing architecture compliance issues within the SWGs
  - Maturing for completing the Proposed Architecture in ’09

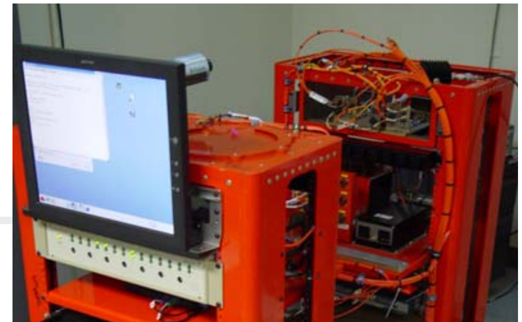
Concept Demo



Drive Before Fly!

- Initial Testing
  - Aberdeen Proving Grounds
    - Vehicle Test track
    - Installed on Humvee
    - Existing Range Infrastructure
      - Cisco 802.11 network
    - Replicate Dropouts
      - Network Dropouts
      - Tm Dropouts

…and Fly We Did!



- Flight Testing
  - Edwards AFB
    - Install on C-12
    - Create rf network over Edwards
      - Harris SecNet 11
  - First flight August 1st, 2006!
- Successfully Demonstrated
  - Mining of data from onboard recorder
  - Remote control of instrumentation system
  - Creation of error-free and drop-out free PCM telemetry

Operational Demo

- Spring ’08
  - Comm Links Team tested 802.11b with transverter
    - Flight tests went well – Paper at ITC
  - Once operational verified they delivered it to the Test Article Segment Team
- Spring/Summer ’08
  - Comm Link Hardware is being integrated with a Test Article Network
  - Installed in Test Pilot School H-60
- Fall ’08
  - First Flight of OP’s Demo
    - Control On-board Instrumentation, Fetch data, Fix SST, etc.
- Plan
  - Test in helo environment
  - CONOPS Validation
  - Integrate into Range infrastructure

Deployment

- FY12
  - System Design and Development
    - Fully deployed system at two ranges
      - Air Force Flight Test Center – Edwards
      - Naval Air Warfare Center- Aircraft Division – Patuxent River
      - ???
    - Initial Operational Capability (IOC)
      - Support for most scenarios

What Others Are Saying

- The Japanese Gov't has launched and official study of iNET
  - Goal is to put iNET like capability on their range
  - Sent a delegation to ITC to investigate iNET
- iNET received the ITEA Publication Award for 2006
  - "Through in-depth research and a concise presentation, the authors precisely convey how iNET is taking a systems approach to reengineer telemetry...thus meeting the challenges of testing the next generation of weapon systems
- Recent Letter signed by Range Commanders Council
  - "iNET is designed to enable the ranges to conduct our missions with system-of-systems weapons in a manner that replicates how we intend to fight with them. "

Questions???

Capability Enhancements

- Recover telemetry dropouts
- Access (random) to data on onboard recorder
  - More efficient test
  - Unexpected event investigation
  - Inter-maneuver analysis
- Error free data delivery
  - Many processing algorithms cannot tolerate errors
- Control of instrumentation from the ground
  - Control Instrumentation operation
  - Reprogram PCM downlink
  - Etc.
- Hot Mic
  - Test Team Unique/between multiple assets
- Etc.

RETURN

Leverage the Revolution

- Within DoD and the private sector
  - Networks are the solution of choice!
  - Virtually all new wireless services are network based
- Vast investment of intellectual and financial capital
  - Modulation schemes, coding, protocols, etc
  - Huge investment in a common problem
    - The wireless movement of data!
    - Unprecedented in our history

RETURN

Flexibility For Tomorrow!

- The ability to meet as yet unforeseen future requirements is critical
  - How will we test future weapons?
    - Complex systems of systems?, swarming UAVs?, sensor networks?, etc.
- Networks are inherently very flexible
  - The internet, phone system, etc.
- Layered approach facilitates technology upgrades

RETURN

Spectrum – Use It All!

- Networks hold the promise of allowing the management of pooled spectrum
  - All available spectrum shared among test articles
  - Real-Time and priority based allocation of spectral resources
  - Allow on demand transmission of data
    - Vice continuous transmission
  - Meet demand for large numbers of parameters with average bandwidth of data
- Retain continuous transmission for time critical and safety of flight data

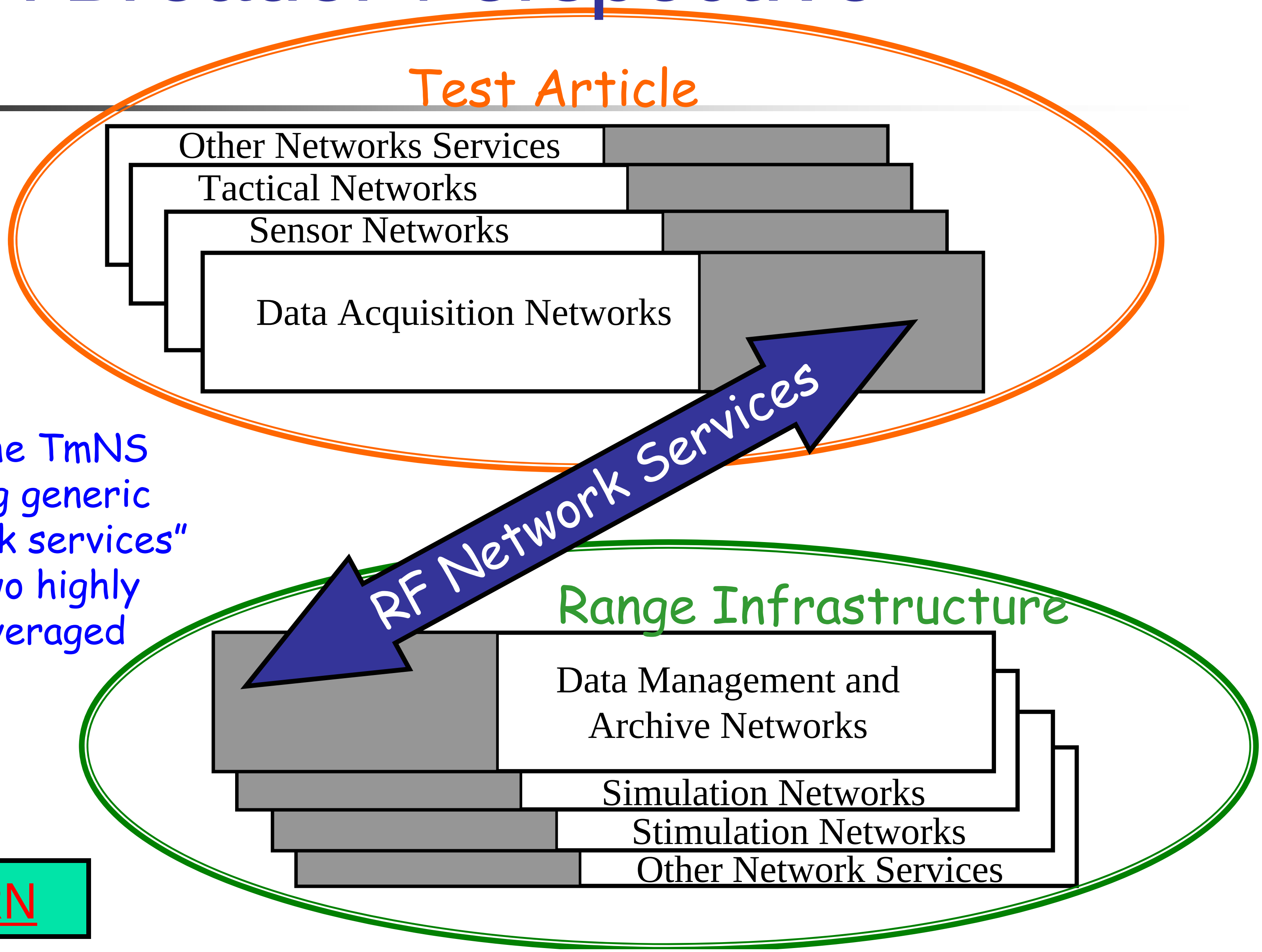
Spectrum – Use It Efficiently!

- Traditional Telemetry
  - Point-to-point telemetry only
  - Single level of service provided
    - All data receives time critical quality of service delivery
  - It is spectrally inefficient to provide time critical delivery for ALL telemetry data
- Network Enhanced Telemetry
  - Point-to-point and network telemetry combined
    - Multiple levels of service provided
      - Move **ONLY** time critical data within milliseconds
      - Down-link the rest over the next few seconds or minutes
    - Multiple levels of service allow more flexible and efficient use of scarce spectral resources!

RETURN

More than Just Tm!

A Broader Perspective



Consider the TmNS as providing generic "RF network services" between two highly network leveraged assets

RETURN

Composite Engineering Inc.

The High Performance Aerial Target Company

BQM-167A/i

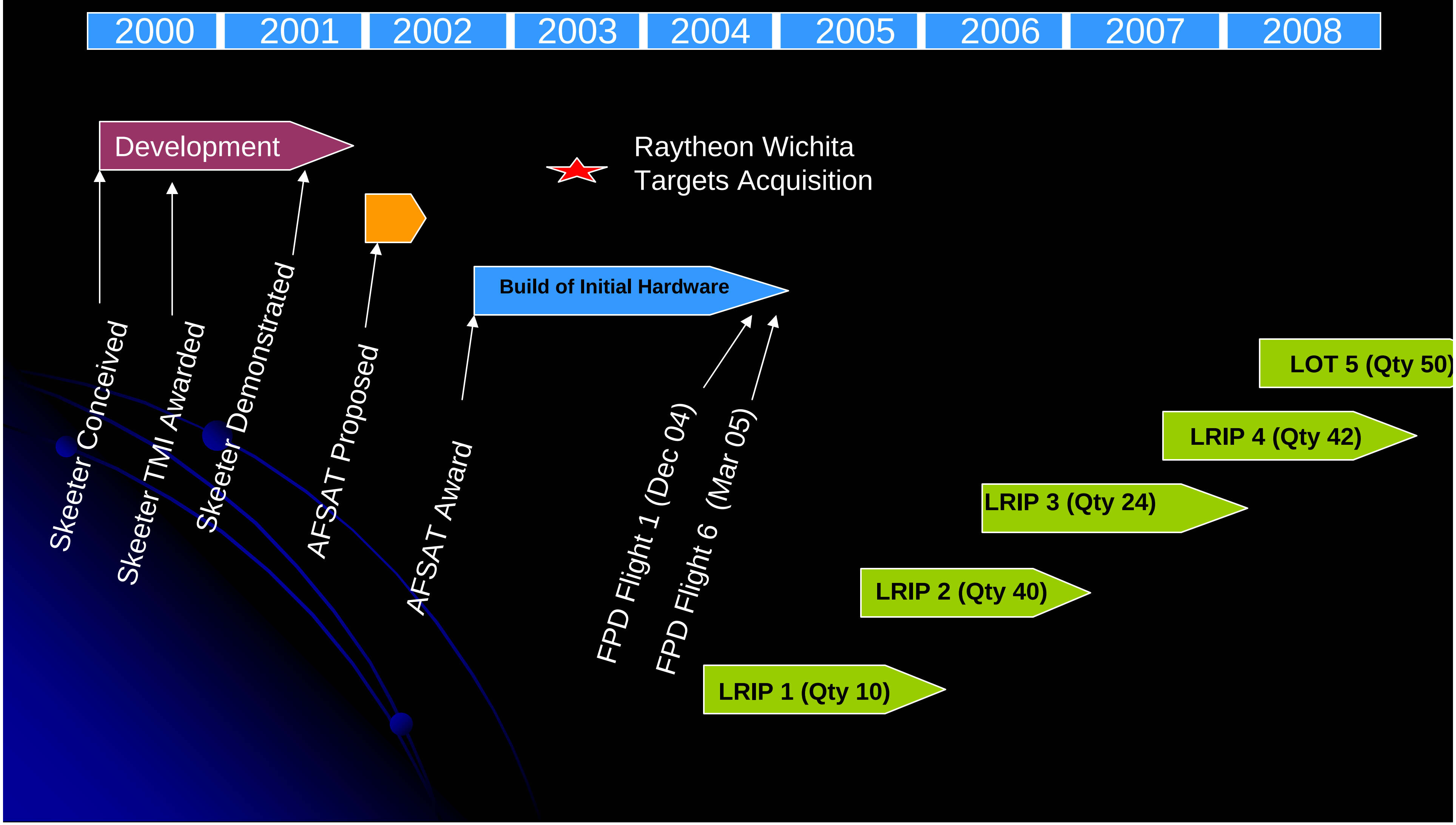
Aerial Target System

Company Background

Legacy in Aerial Targets

The BQM-167A
World Class Aerial Target System

Evolution of the BQM-167 Platform



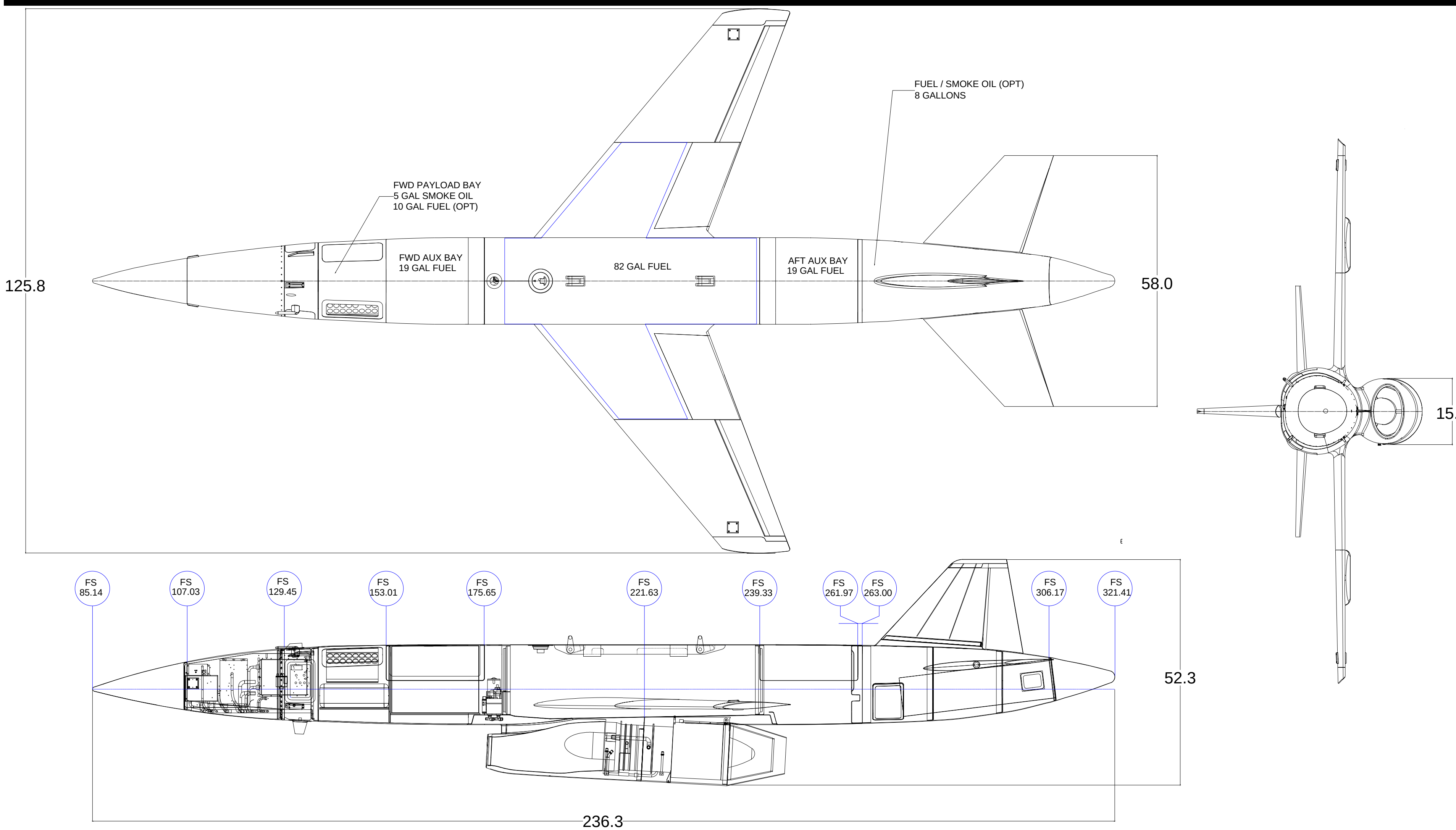
Spectacular Beginning

6 Weeks Later

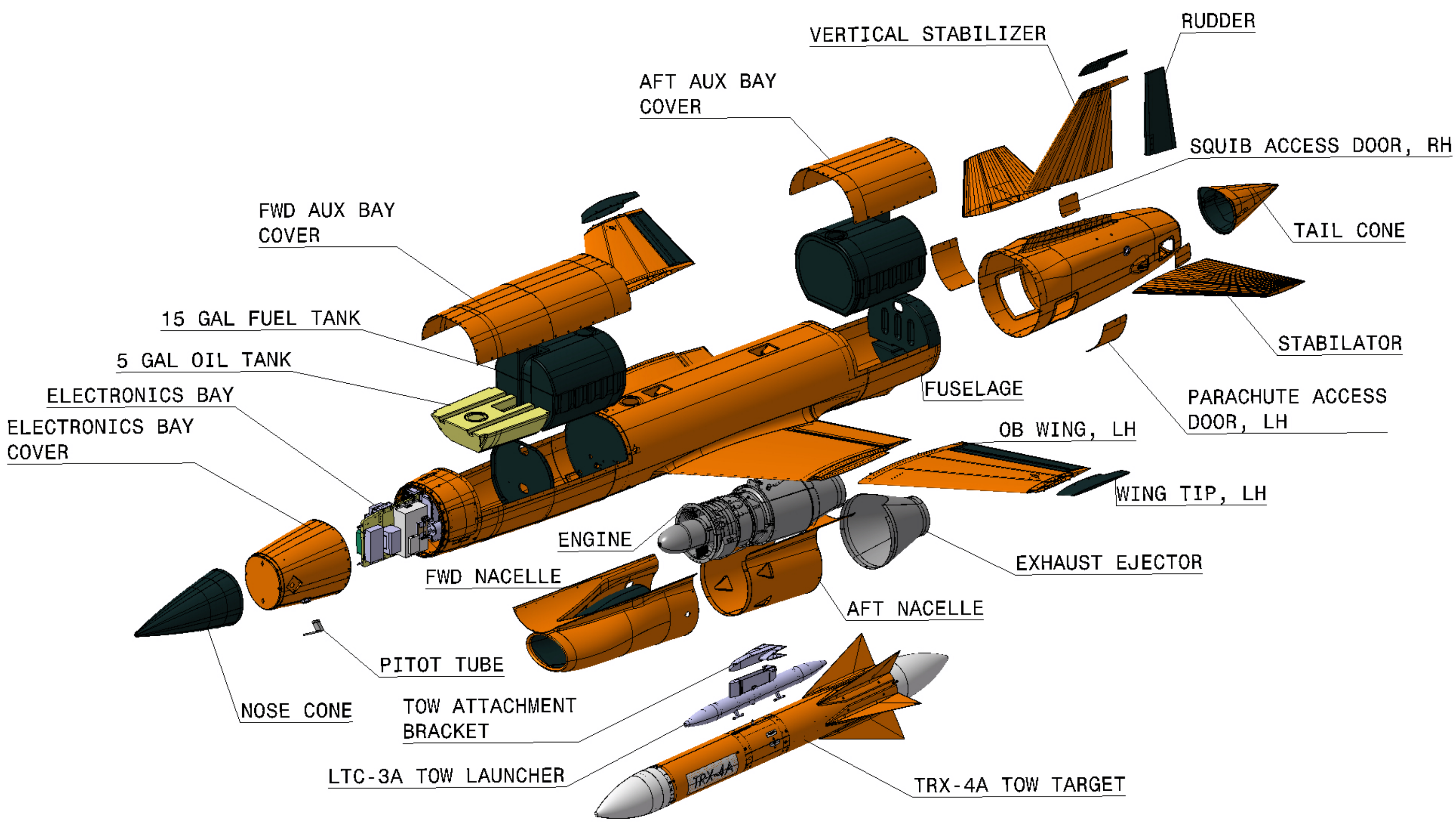
And 2 Weeks After That

Current Target Tyndall Target Op

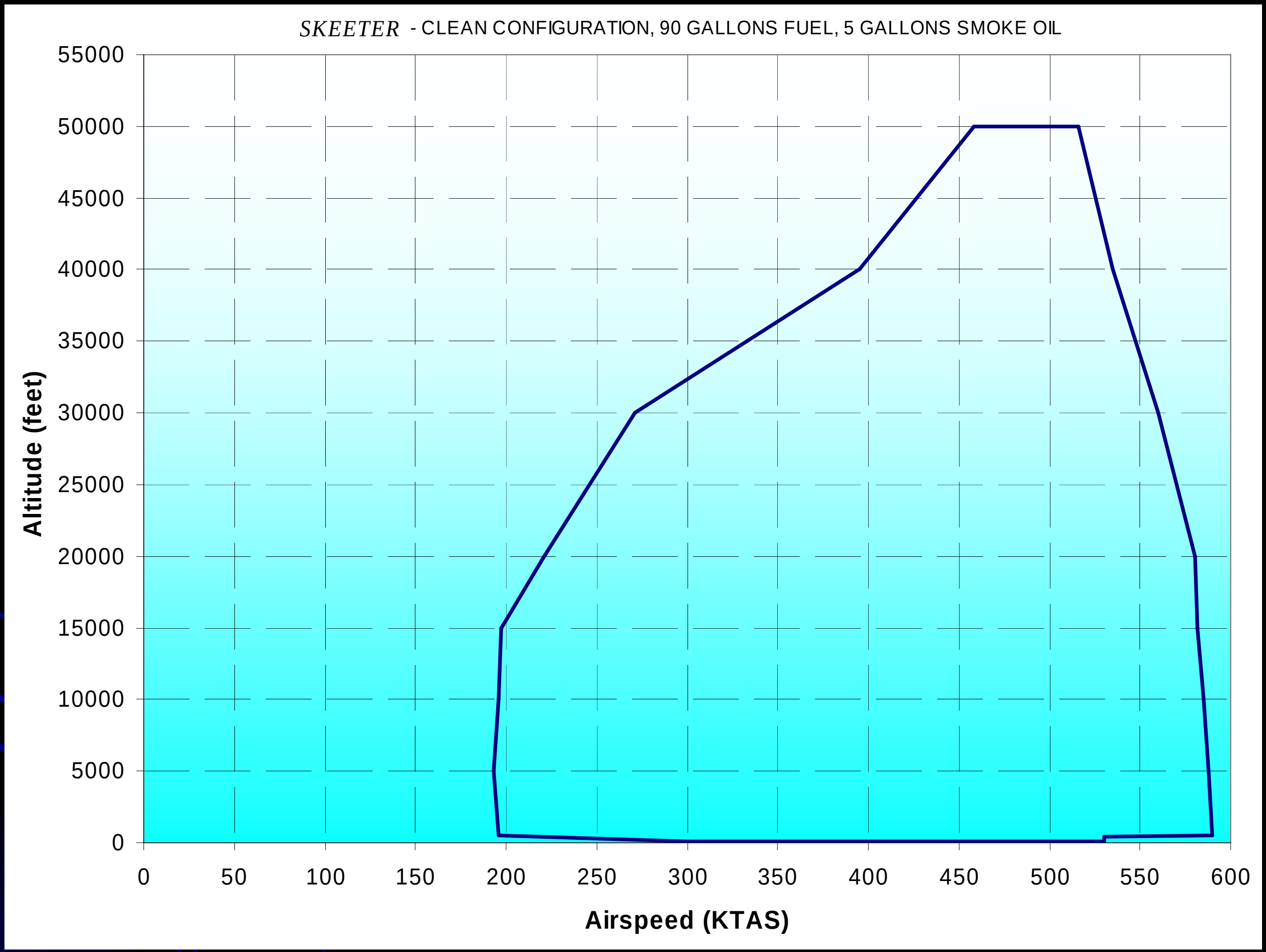
BQM-167 Basics



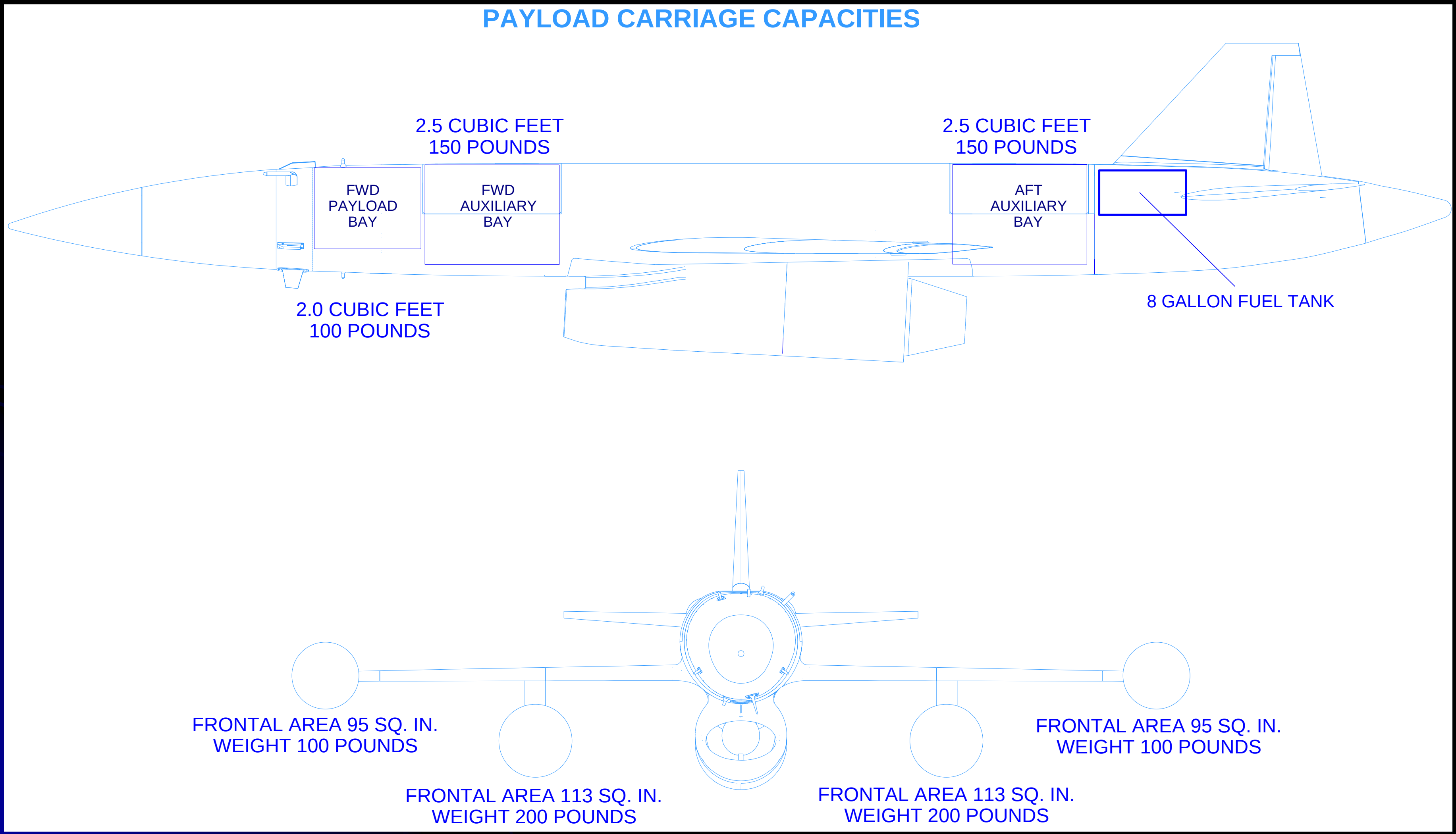
BQM-167 Expanded System View



Performance Envelope



Payloads


PAYLOAD CARRIAGE CAPACITIES
2.5 CUBIC FEET
150 POUNDS
2.5 CUBIC FEET
150 POUNDS
FWD
PAYLOAD
BAY
FWD
AUXILIARY
BAY
AFT
AUXILIARY
BAY
2.0 CUBIC FEET
100 POUNDS
8 GALLON FUEL TANK
FRONTAL AREA 95 SQ. IN.
WEIGHT 100 POUNDS
FRONTAL AREA 95 SQ. IN.
WEIGHT 100 POUNDS
FRONTAL AREA 113 SQ. IN.
WEIGHT 200 POUNDS
FRONTAL AREA 113 SQ. IN.
WEIGHT 200 POUNDS

Flight With Heavy EA Pods

Recovery System

- 9.85 ft Conical Ribbon Drogue
  - Based on a planform used for aircraft spin / stall recovery system

Recovery System

- 62.2 ft Slotted Polyconical
  - Modern planform
    - Cruciform & ring slots
    - Sails

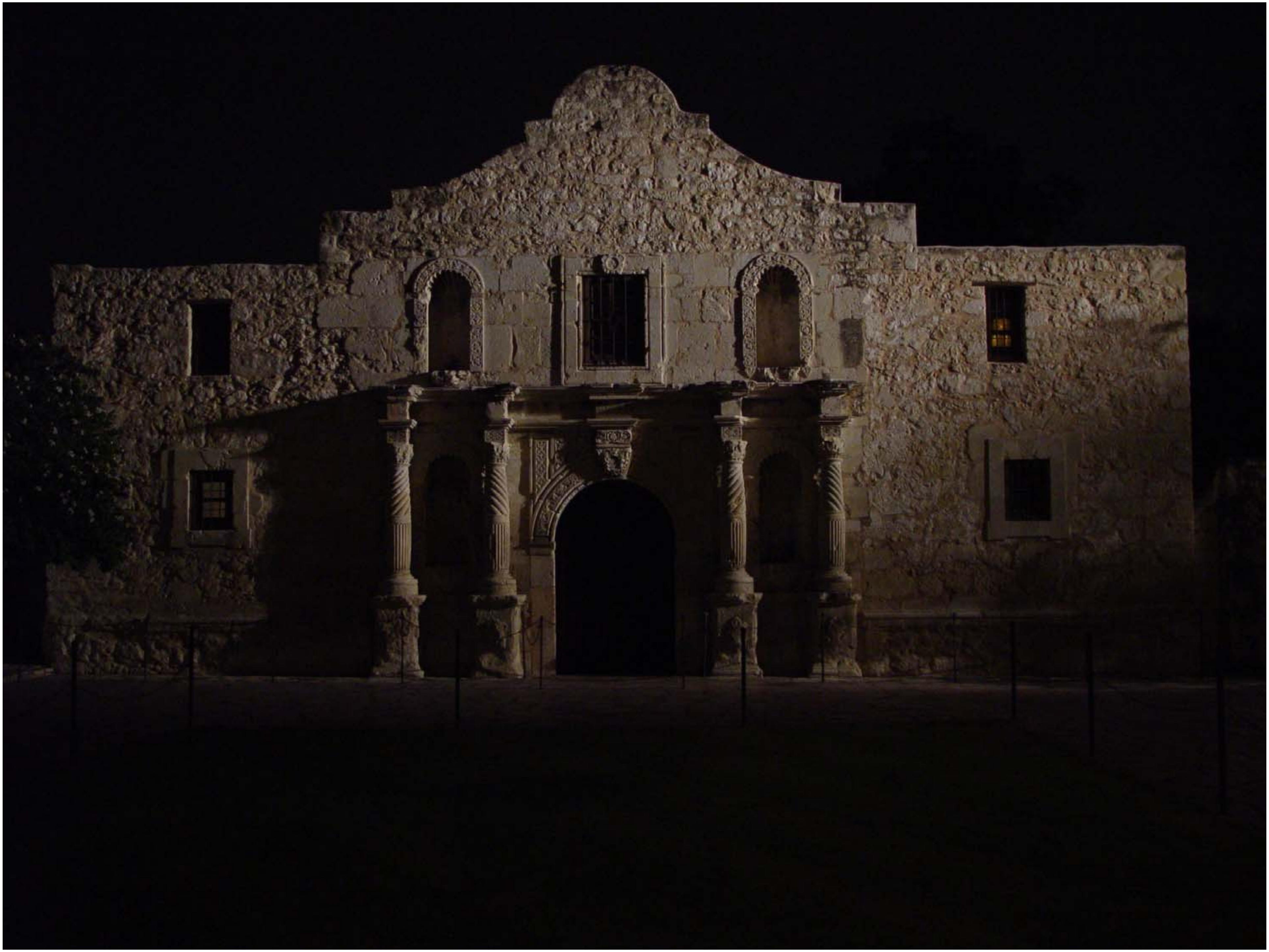
Bottom Line

- Fast…….over .9 Mach
- High……over 50k ft
- Maneuverable……up to 9g
- Strong……Carbon Fiber
- Supportable…..Long Range USAF plans
- Flexible
  - Skin Shots
  - Tows
  - Internal Payload Space
- Potential to Evolve

BQM-167 Continued Evolution

- Deployment of BQM-167 using GRDCS
- Internalized EA
- Alternate Launch Methods

From Evolution to Revolution
The BQM-167X



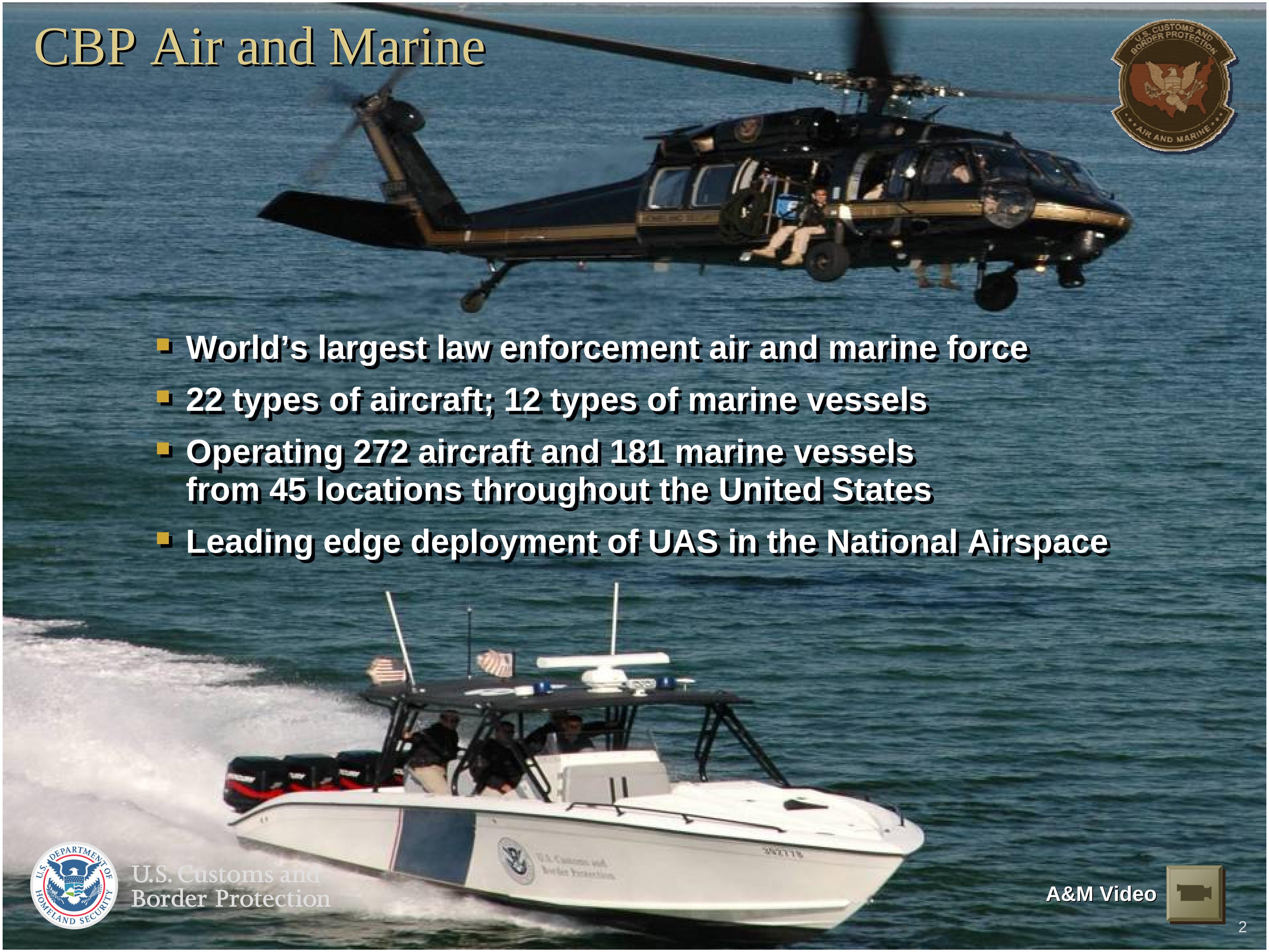
Office of
Customs and Border Protection Air and Marine

Unmanned Aircraft Systems and the Homeland Security Mission

Presented by: Major General Michael C. Kostelnik USAF (Ret.)
Assistant Commissioner
U.S. Customs and Border Protection
Office of CBP Air and Marine

October 2008

U.S. Customs and
Border Protection


CBP Air and Marine
World's largest law enforcement air and marine force
22 types of aircraft; 12 types of marine vessels
Operating 272 aircraft and 181 marine vessels from 45 locations throughout the United States
Leading edge deployment of UAS in the National Airspace
U.S. CUSTOMS AND BORDER PROTECTION AIR AND MARINE
U.S. DEPARTMENT OF HOMELAND SECURITY
U.S. Customs and Border Protection
A&M Video
2

Department of Homeland Security

U.S. Customs and Border Protection

U.S. Customs and Border Protection
Securing the Borders and Preventing Acts of Terrorism

U.S. Customs and Border Protection

Field Operations

Office of CBP Air and Marine

Border Patrol

CBP Air and Marine Mission Statement

*W*e protect the American people and Nation's critical infrastructure through the coordinated use of integrated air and marine forces to detect, interdict and prevent acts of terrorism and the unlawful movement of people, illegal drugs and other contraband toward or across the borders of the United States.

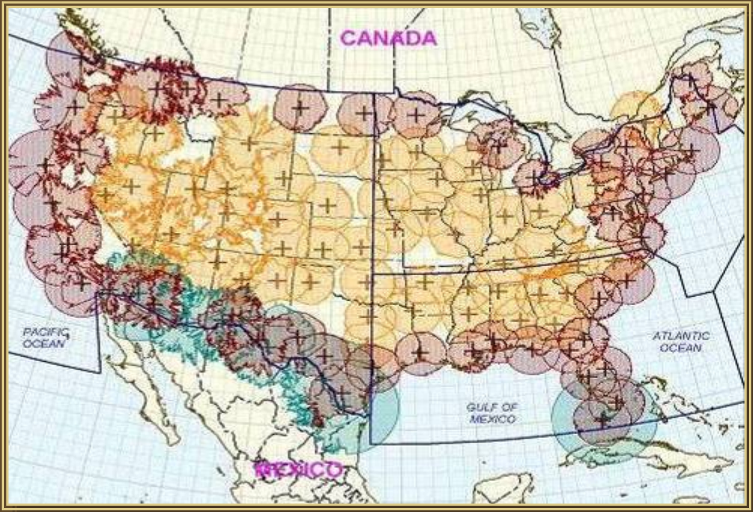
CBP Air and Marine Operating Locations

U.S. Customs and Border Protection

CBP Air and Marine Operations Center
Riverside, CA

AMOC – DHS Center of Excellence

- **450 FAA, DoD and Aerostat radar feeds**
- **Multiple law enforcement data bases and communications networks**
- **Detects, sorts, and monitors suspect air and marine tracks of interest**
- **Building command and control center and intelligence teams for National UAS operations**



U.S. Customs and Border Protection

Southwest Border Region













- 2000 miles of border
- 22 Air and Marine locations
- 129 aircraft and 72 vessels
- Illegal immigration and drug trafficking
- Contraband transported by vehicles, pack animals and humans

U.S. Customs and Border Protection

Northern Border Region











- Longest unprotected border in the world: 4000 miles
- Illegal immigration and drug trafficking
- 12 Air and Marine locations
- 35 aircraft and 60 marine vessels
- Threats include air, marine and ground
- 5 air wings opened since 2003

U.S. Customs and
Border Protection

Southeastern Coastal Region





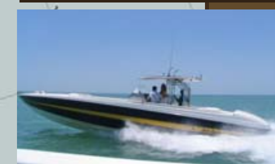





- More than 2,000 miles of coastline
- 27 Air and Marine locations
- 51 aircraft and 46 marine vessels
- Illegal immigration and drug trafficking

U.S. Customs and Border Protection

Interior Enforcement: ICE Support



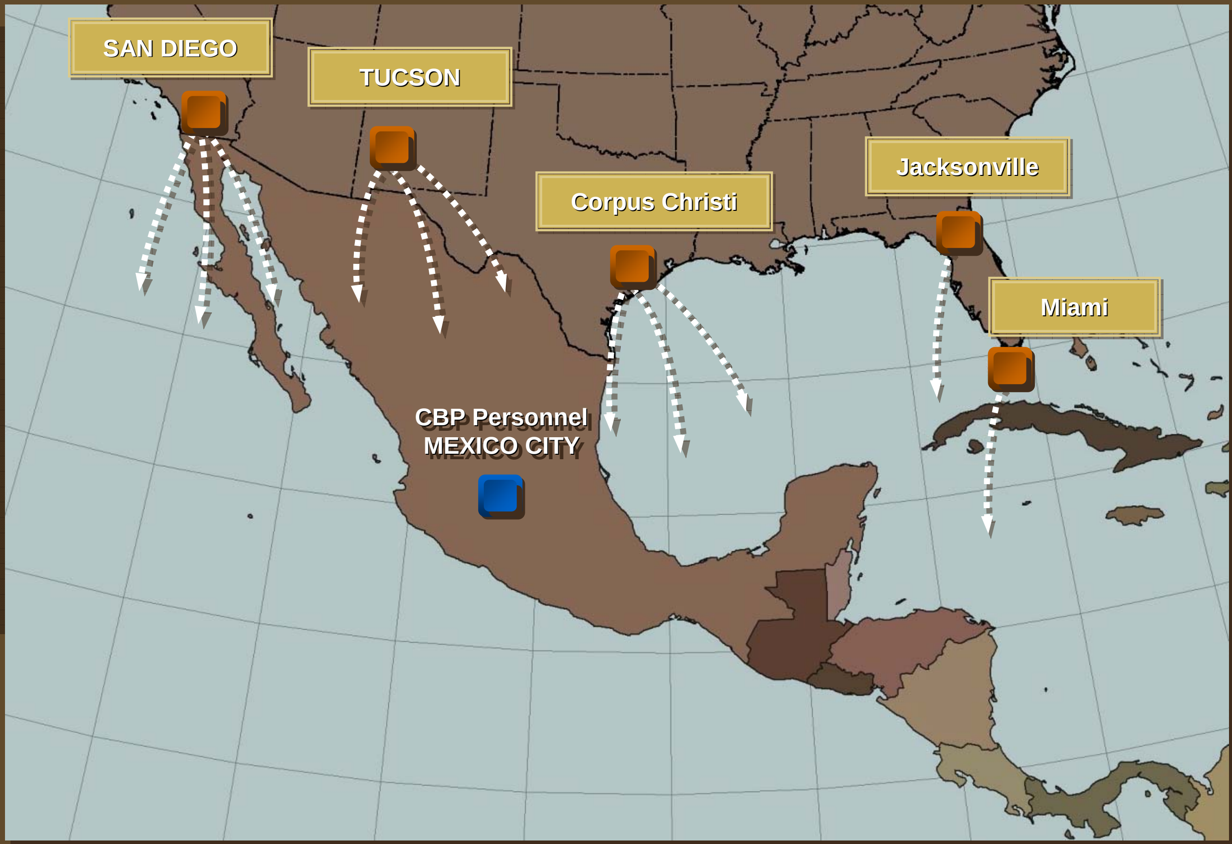
- National HQ - Washington DC
- Air and Marine
- Air
- Marine
- Air and Marine Training Centers
- Wing Commander
- UAS Operations Center

- Provide law enforcement support from existing A&M branches
- Support includes
  - Surveillance of persons, places and things for enhanced situational awareness and increased officer safety
  - Tactical insertion of warrant teams
- FY 2007 included 3,757 flight hours and 2,016 float hours

U.S. Customs and Border Protection

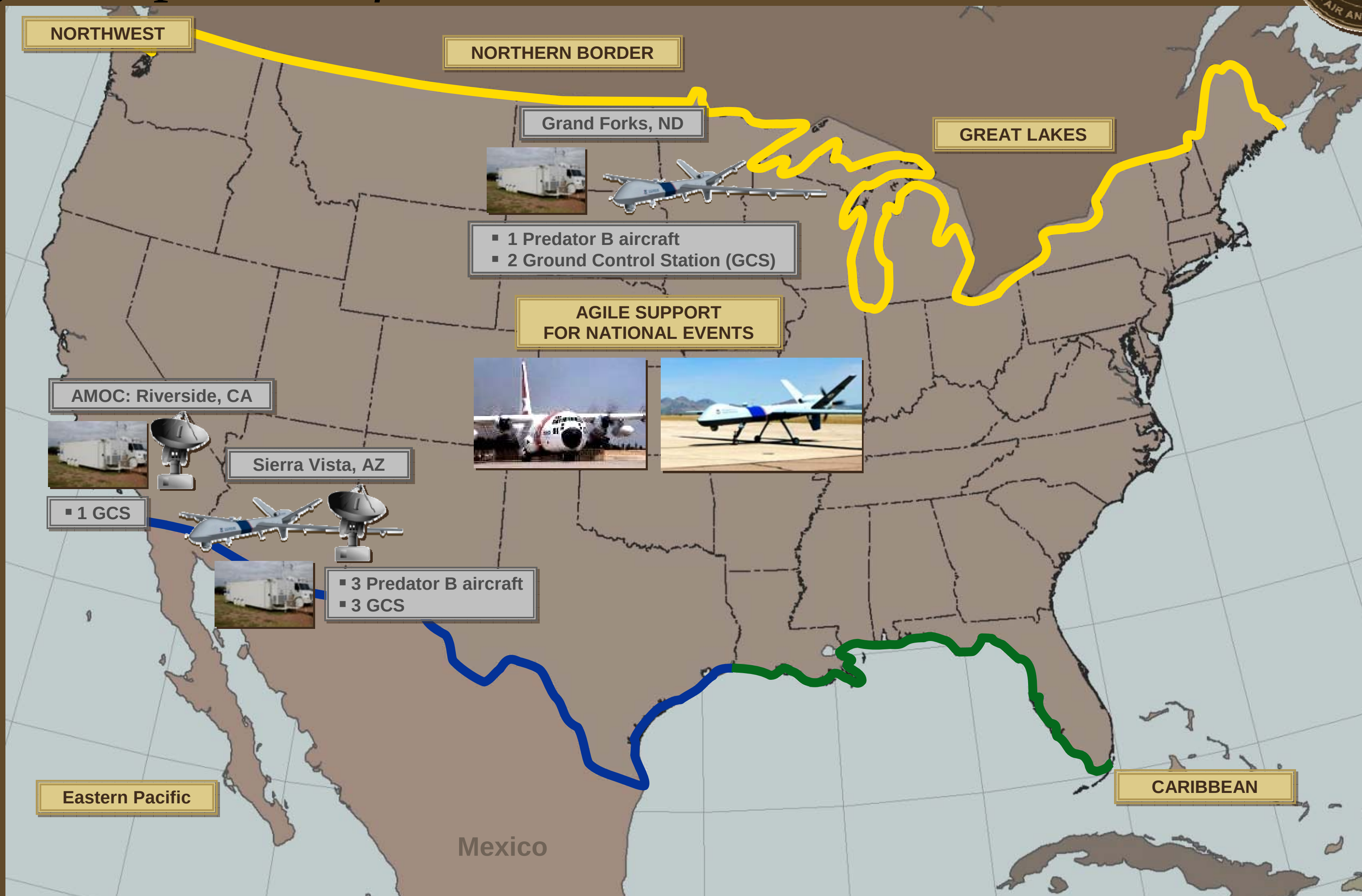
Mexico/Source/Transit Zone
Interdicting Drugs and Drug Traffickers

- Support to Mexican Law Enforcement: Operation Halcon
- Support to Joint Inter-Agency Task Force South (JIATF-S)
- Operations support Office of National Drug Control Policy (ONDCP)
- Semi-submersibles



U.S. Customs and Border Protection

UAS Operational Deployment
Key Component of Secure Border Initiative



U.S. Customs and Border Protection

- Two additional Predator B's to be delivered in FY 2008
- Funding for additional aircraft in FY 2009 for maritime prototype

Predator B:
Key Enabler for Homeland Security Mission!

Proven flight systems

- **Predator family of aircraft flown by the USAF for more than 10 years and 350,000 hours**
- **Predator B has more than 1500 hours in border security role**

High performance aircraft and multi-spectral systems

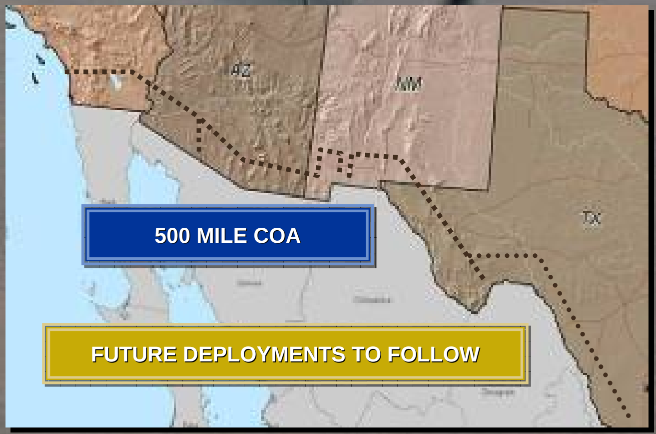
- **30+ hours flight time**
- **MTS B Electro Optical/Infrared Radar**
- **Lynx Synthetic Aperture Radar (SAR)**
- **Laser illuminator**
- **Large payload capacity for variety of sensors**
- **Baseline candidate for Maritime Variant**

Worldwide Command and Control Capability Through Satellite Infrastructure

U.S. Customs and Border Protection

Predator Operations Today

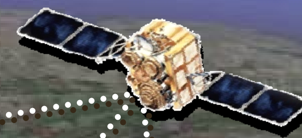
- Libby Army Airfield, Sierra Vista, AZ
- A&M hub for testing, training and initial Arizona Border operations
- Four Predator B's in service today
- Two more enter service in CY 2008; One more in CY 2009
- Operations to expand along Southwestern Border and to Northern Border in 2008



U.S. Customs and Border Protection

UAS Video

2008 Joint Maritime UAS Demonstration



Sierra Vista, AZ Command and Control

TYNDALL AFB
Launch and Recovery

W-470B

- Joint maritime ACTD March 17-28, 2008
- Partnership with USCG, FAA and USAF
- Basis for joint maritime ORD – Predator B maritime variant
- Joint UAS Requirement's Summit in July
- Joint CBP USCG program office established to develop maritime Predator B variant

W-174

W-465

U.S. Customs and Border Protection

Predator UAS Support to DHS Hurricane Operations

- UAS and ground support equipment rapidly deployed from Sierra Vista, AZ to NAS Corpus Christi, TX
- Mission prioritization and FAA coordination at AMOC in Riverside, CA
- 74.9 hours flown; more than 260 points of interest mapped or viewed

- 11.9 hour flight covering Georgia, South Carolina and North Carolina Coast
- Pre- and Post- hurricane Synthetic Aperture Radar mapping
- Imagery analysis by CBP Air and Marine
- Streaming video provided to multiple customers via website

U.S. Customs and Border Protection

Fox News Video

Post Landfall Assessment
MTS-B EO/IR Camera

Damaged bridge over Roll Over Pass on Highway 87 North Of Galveston, TX

Predator is at 27,000ft MSL

Range to bridge is 11.9 miles

Damaged Property at Surfside Beach South of Galveston Texas

Predator B is at 22,000ft MSL

Range to building is 7.4 miles

U.S. Customs and Border Protection

Post Landfall Assessment
Lynx Synthetic Aperture Radar

TARGET: South Texas Nuclear Generating Station
LAT/LON: 28.7958° N 96.0512° W
TOT: 16 SEPT 2008 – 1823Z

U.S. Customs and Border Protection

CBP UAS Operations on Leading Edge

- **Operating day and night along the Nation's borders**
- **Operations to expand across Southwest and Northern Border as additional aircraft enter service**
- **Joint Program Office underway to develop Maritime Predator B**
- **Key air component of Secure Border Initiative**

U.S. Customs and Border Protection

Force Multiplier to the Homeland Security Mission!

U.S. Customs and
Border Protection

Return to Previous Slide

U.S. Customs and
Border Protection

Return to Previous Slide


FOX REPORT
w/ SHEPARD SMITH

86th Fighter Weapons Squadron
COMBAT HAMMER

Evaluating PGM Weapon Systems – Weapon Storage Through Impact

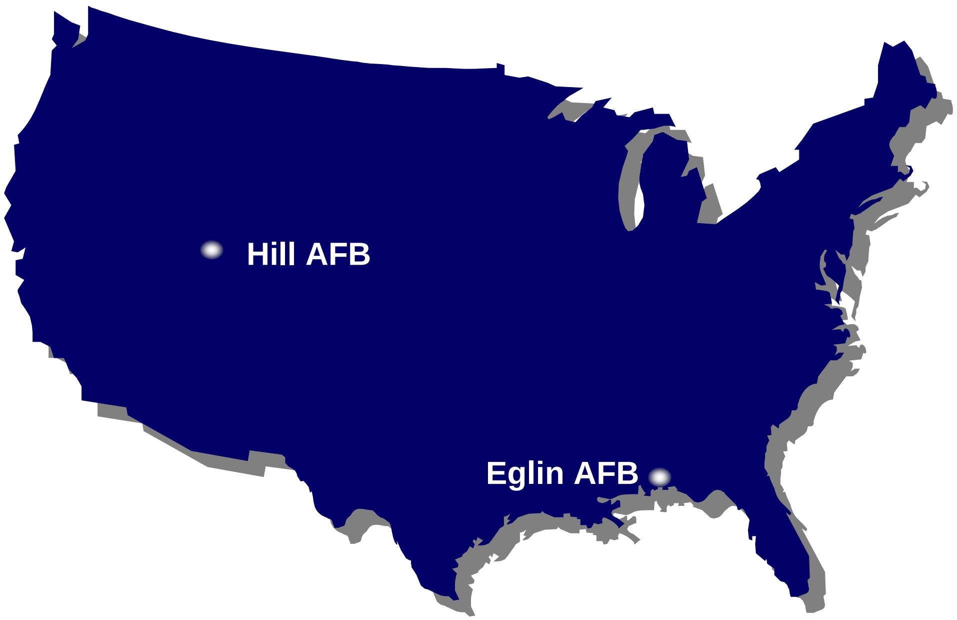
Air-to-Ground Weapons System Evaluation Program (WSEP)

Lt Col Dean Ostovich
86 FWS/CC

Overview

- 86 FWS Program
- Ranges and Targets
- Instrumentation / Data Collection
- Statistical Methods
- Future Focus

86 FWS



Perfecting Lethality

Mission Statement

COMBAT HAMMER

“Evaluate the effectiveness, maintainability, suitability, and accuracy of precision guided munitions and high technology A/G munitions from tactical deliveries against realistic targets with realistic enemy defenses.”

A/G WSEP Mission

- End-to-end Evaluation
- Integral Part of AF / DOD Life Cycle Acquisition and Sustainment Program
- Not just ACC…Evaluations Support AFMC / DoD WRM Considerations
  - Extensive Program Office liaison
  - Symbiotic relationship (Hardware & Software)

1986 - 2008

- Initial Charter 1986 - *COMACC PLAN 90, "Air-to-Ground Weapon Systems Evaluation Program"*
- 1986: 9 Units / 50 Weapons
- 2007: 19 Units / 369 Weapons
- Aug 08: 7 Units / 183 Weapons
- We Own a Growth Industry
  - Annual program resource requirements (infrastructure, funding, manpower) increasing in scope commensurate with rapid rise in CAF PGM capabilities
  - Sustained requirement is 20 WSEPs annually with a 22-24 WSEP "surge" capacity in any given year employing 350 weapons

CAF Air-to-Ground Arsenal

- B-1B
  - GBU-31/38
  - GBU-39
  - CBU-103/4/5
  - AGM-154A
  - AGM-158
- B-2A
  - GBU-31/38
  - GBU-39
  - AGM-154A
  - AGM-158
- B-52H
  - GBU-12
  - GBU-31/38
  - GBU-39
  - AGM-86C/D
  - CBU-103/4/5
  - AGM-154A
  - AGM-158
- F-117A
  - GBU-10/12/27
  - GBU-31
- MQ-1 Predator
  - AGM-114
- MQ-9 Reaper
  - GBU-12
  - GBU-38
  - GBU-39
  - AGM-114
- A/OA-10
  - AGM-65D/G/G2/H/K
  - GBU-10/12
- A/OA-10C
  - GBU-10/12
  - GBU-31/38
  - AGM-65D/G/G2/H/K/E
  - CBU-103/4/5
- F-15E
  - GBU-10/12/24
  - (E)GBU-15/28
  - GBU-31/38/53
  - GBU-39
  - CBU-103/4/5
  - AGM-130
- F/A-22A
  - GBU-32
  - GBU-39
- F-16B30
  - GBU-10/12/24
  - GBU-31/38
  - AGM-65D/G/G2/H/K/E
  - AGM-88
  - CBU-103
- F-16B40
  - GBU-10/12/24
  - GBU-31/38/53
  - AGM-65D/G/G2/H/K/E
  - CBU-103/4/5
  - AGM-154A
- F-16B50
  - AGM-65D/G/G2/H/K/E
  - AGM-88
  - AGM-154A
  - GBU-31/38/53
  - CBU-103/4/5
  - GBU-10/12
  - AGM-158

FY07 - 12 Platforms
39 Weapon System Combinations

A/G WSEP Mission Execution

- Fighter Squadrons Deploy to Eglin and Hill AFB
  - 8-12 jets; one and two week evaluation deployments
    - Typical unit 12-18 aircrews; 100-150 people deployed
    - Ammo troops up front (2 wks early)
- Bomber / UAS Squadrons Execute From Home Station
- Hammer Constructs Realistic Scenarios
- Weapons, Platforms, and Targets “Instrumented”
- Hammer Collects Data, Conducts Analysis, and Determines Weapon System Effectiveness

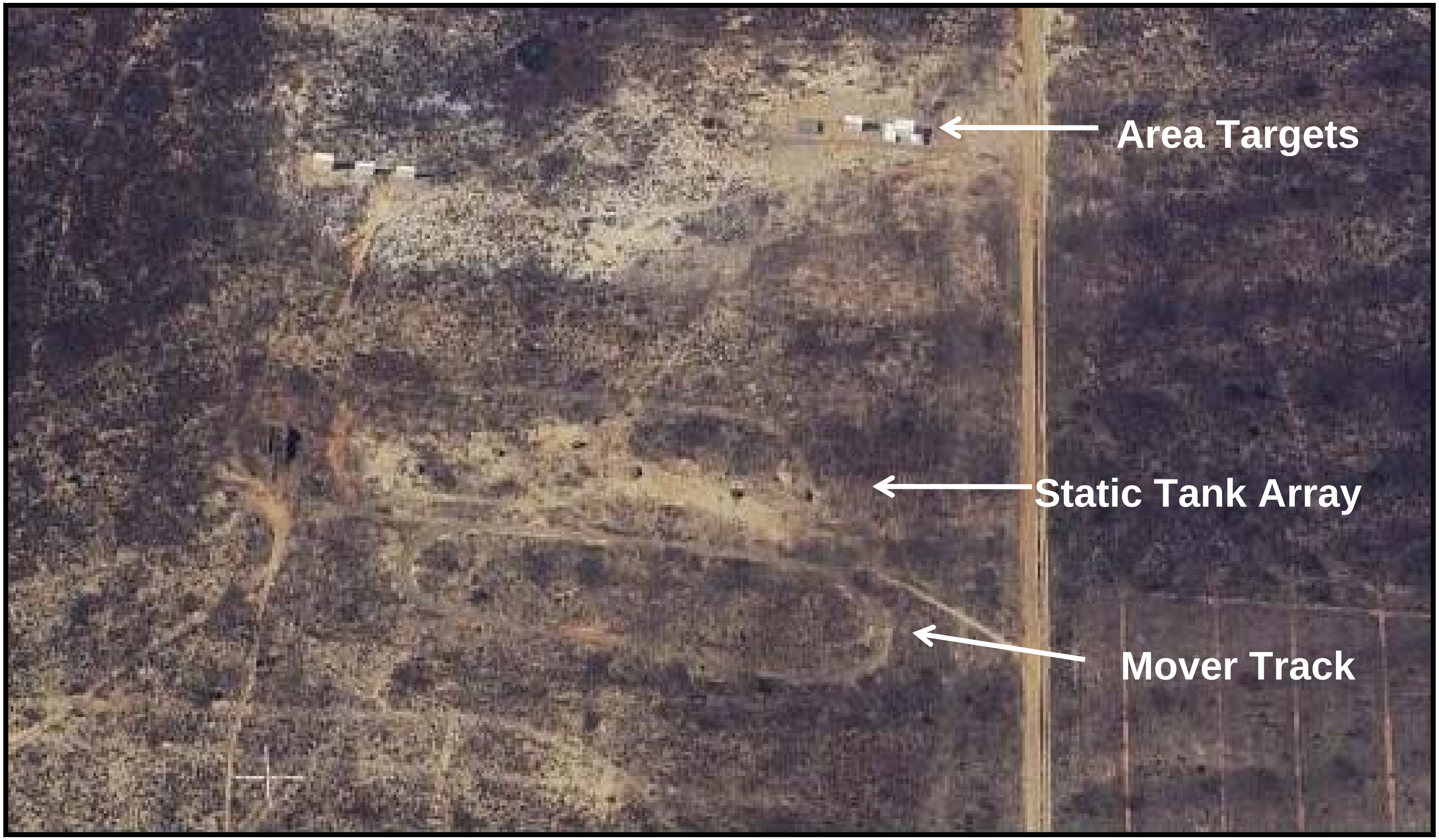
Ranges and Targets

- **Eglin (35%)**
  - **High humidity / green environment**
  - **Shoot cones more restrictive**
  - **Moving target**
  - **Urban CAS village (FY09/1)**

- **UTTR (65%)**
  - **Desert / barren environment**
  - **Permissive shoot cones**
  - **Urban CAS village**
  - **Moving target**
  - **High speed moving target (FY09/4)**

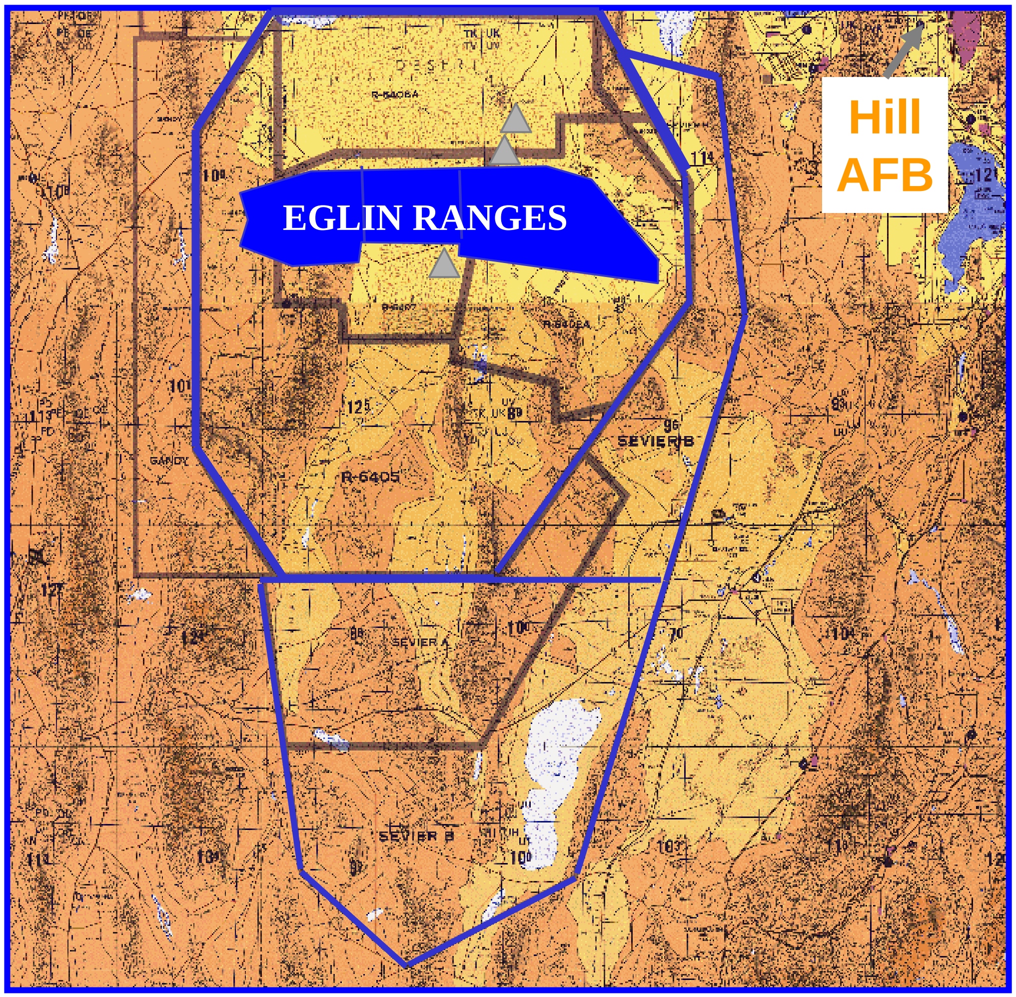
Ranges and Targets

Ranges and Targets



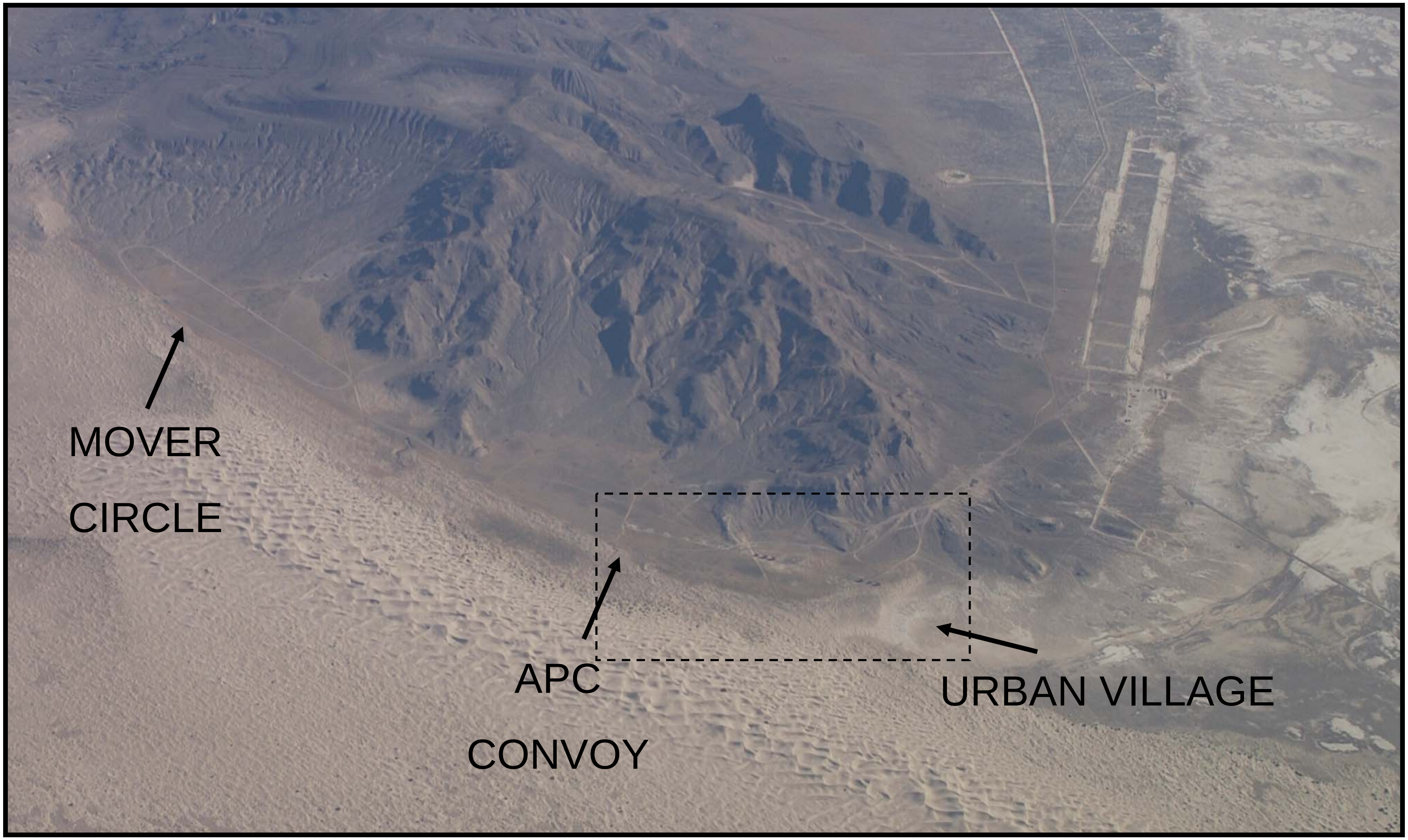
Ranges and Targets

Ranges and Targets



~10 miles

Ranges and Targets



Ranges and Targets

Ranges and Targets

Ranges and Targets

China Lake Mover

Instrumentation / Data Collection

- Time / Space / Position / Information (TSPI)
  - Radar tracking
  - Global Positioning System (GPS)
  - A/C AVTR / DVR-S
- Telemetry
  - Used to the maximum extent possible
  - Assess weapon performance--launch to impact
  - Paveway / AGM-130 exceptions
- Improve Laser Tracker (ILAST)
  - Measures laser designator performance
    - Power output, spot stability, and spot position
    - Boresight check

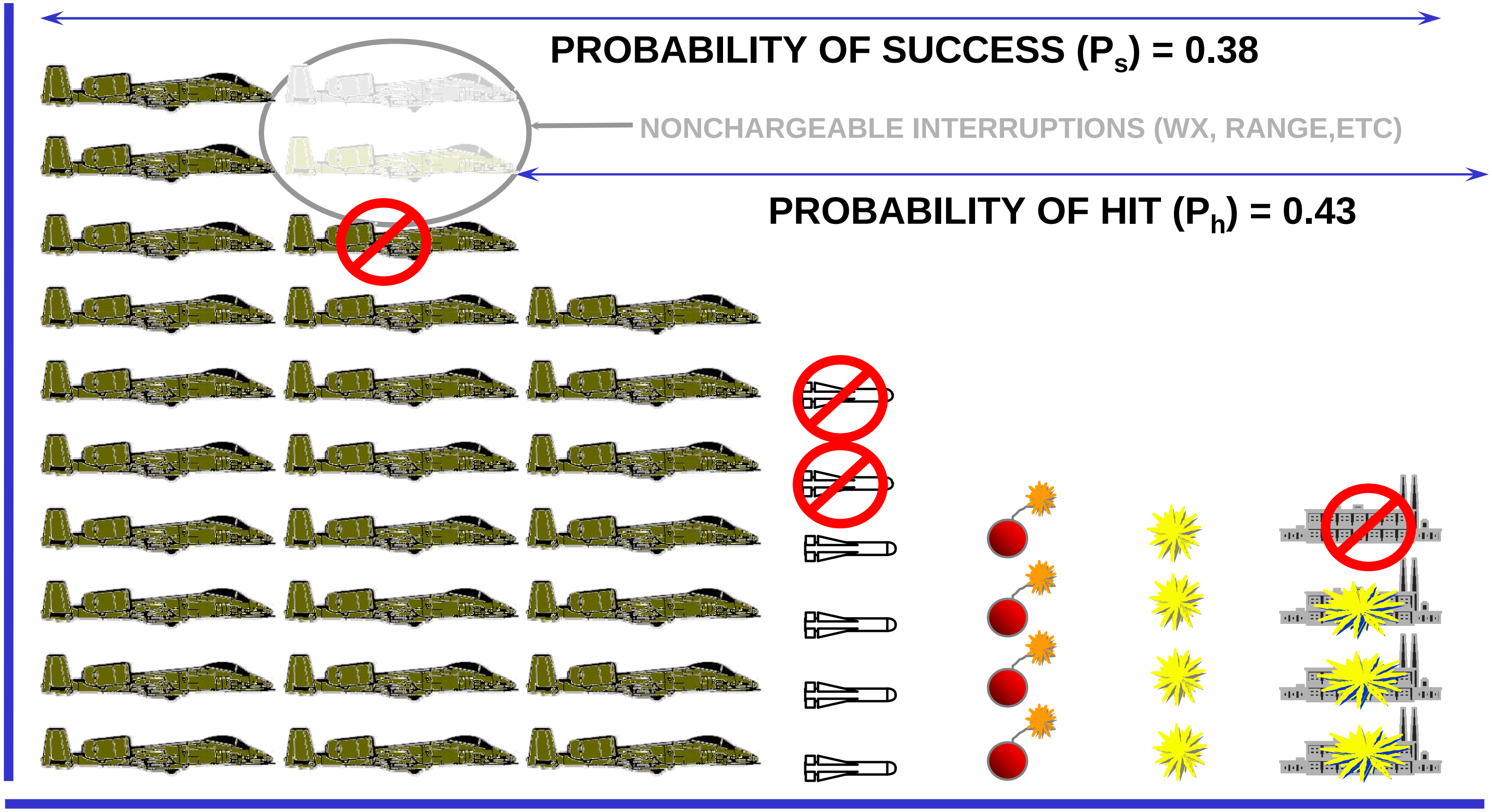
Instrumentation / Data Collection

- **Videometric Analysis System (VMAS)**
  - **Measures weapon impact conditions**
  - **Impact angle, bomb body yaw, and impact position**
- **Effects (LPA)**
  - **Video record of target condition - before / after**
  - **Video record of munitions impacts relative to DPI / DMPI**
- **Chase Aircraft**
  - **Assess tactics and weapon performance post release**
  - **Ensures range safety**
  - **Fills in where no telemetry available**
  - **Desired - not required**

Statistical Analysis

- 8 Evaluation Phases
  - Munitions buildup
  - Ground, enroute
  - Employment, guidance, fuzing, warhead, target damage
- Probability of Success
  - Encompasses all phases except munitions buildup
- Probability of Hit
  - Encompasses last 5 phases
  - Probability of target damage given the opportunity to employ
- Non-chargeable Interruptions
  - Weather, range closure, TM failure

Statistical Analysis



GROUND		ENROUTE		EMPLOYMENT		GUIDANCE		FUZING		WARHEAD		TGT DAMAGE		
10/10		7/8		6/7		4/6		4/4		4/4		3/4		
1.0	X	.88	X	.86	X	.67	X	1.0	X	1.0	X	.75	=	.38

Statistical Analysis

- As defined by COMACC Plan 90:
  - 80% confidence level
  - 10% accuracy level
  - 80% chance Hammer probabilities will be replicated in the real world ($\pm$ 10%)

Statistical Analysis

- **Can't Meet Statistical Significance All The Time**
  - **Currently 98 different weapons system combinations**
  - **Goal achievable over 5 year period (7-10 Wpns per Yr)**

- **Confidence Level Does Not Differentiate Between:**
  - **Different delivery parameters**
  - **Environmental factors**
  - **OFP changes**
  - **Scenario**

Future Focus

- Combined Archer / Hammer
- ACC drawdown vs. USAFE / PACAF / ARC
- Weapons
- Telemetry
- Emitters

Video

Combat Hammer Charter

- *EMPLOY* A/G PGMs and High Technology Weapons
  - A/G WSEP "COMBAT HAMMER"
  - Investigative Firing Program
- *ASSESS/VALIDATE* Combat Capabilities
  - Total weapons system
  - "Storage through impact"
  - Ops units, combat realistic scenarios, and realistic threat replication
- *IMPROVE* A/G PGM Effects
  - Telemetry
  - Recommend changes
  - Maintain comprehensive database
- *PROVIDE* Expertise on Demand
  - "ON-CALL" capability

53D Weapons Evaluation Group

Integrity - Service - Excellence

Hugh Harris Scholarship

- My Purpose
  - Provide annual update to the membership
  - Review/Inform membership on application procedures
  - Solicit your continued support by
    - Identifying qualified applicants
    - Providing continued financial support

Educational Crisis

- In 30 Years US Public Education Dropped from No. 1 in the World to No. 29
- All-Science Degrees (% of total awarded)
  - Korea: 37.8%
  - Mexico: 28.1%
  - US: 17.6%

Scholarship Status

- Established in 1991: Goal $50K, to be self sustaining
  - Funds Administered by NDIA HQ.
- First Scholarship Awarded in 1992
  - One $1000 Award in ’92
  - Increased to seven in 2000
  - Awarded $49K to date
- This year’s winners
  - Lauren Foy: Univ. of FL, Bio-Engineering
  - Anthony Nguyen: Univ. of FL, Physics
  - Kyle Schental: Princeton, Chemistry
  - Graham Piburn: Rice Univ., Chemistry
  - Whitney Schmieder: Univ. of FL, Mechanical Engineering

Scholarship Schedule

- 20 January: Members identify applicants
- 1 February: Mail info packets to applicants
- 15 March: Applications to Scholarship Committee
- 1 April: Scholarship Committee ranks applicants
- 10 April: Executive Committee determines number and amount of scholarships
- Mid-August: NDIA issues scholarship grants

Eligibility

- Be a US Citizen
- High school senior or graduate
- Applied to/enrolled in accredited 4 year college
- Pursuing technical career
  - Engineering: Aerospace, Chemical, Electrical, Civil, Computer Science, Industrial, Mechanical
  - Related technical fields: Physics, Chemistry, Mathematics, Software Engineering

Eligibility (continued)

- Sponsored by Targets/Ranges Division member (individual or corporate)
- Sponsored by Gulf Coast Chapter
- Recipients of full scholarships (military academy, ROTC, etc.) are ineligible
- Enrollments in 2-year community colleges are ineligible
- Complete by-laws are available upon request

Your Responsibilities

- Identify Potential Applicants
- Notify Scholarship Committee

  Cort Proctor

  1542 Glenlake Circle

  Niceville FL 32578

  email: cortp@aol.com
- Ensure continued donations (corporate/individual)

2008 Contributors

- NDIA’s Gulf Coast Chapter: $3000

THANKS

Questions

?

OPNAV N43 Readiness & Ranges

Cost of Readiness Earned From Range Use

October 9, 2008

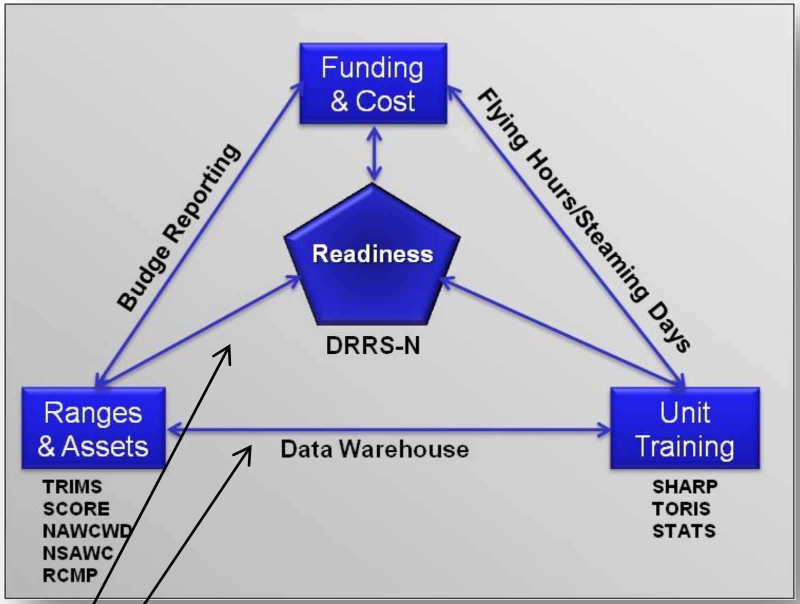
Steve Shegrud
Whitney, Bradley & Brown
703-448-6081 ext. 263
sshegrud@wbbinc.com

Study Background

- WBB—who we are
- Working for OPNAV/N433 (Range Office)
- Goals
  - Better defend Range $$ during budget process by:
    - Linking fleet readiness gained to range usage
    - Show readiness impact of budget decisions
  - Help make more informed range investment decisions
    - Accurate/timely cost, usage and readiness data
  - Better defend DoN Ranges against Encroachment challenges
  - Do so with existing databases

Why Link Readiness to Range Use & Cost?

- 3 legacy databases for each community
  - Independent data functions
  - All accomplishing intended tasks
- Readiness picture requires <u>T&R</u>, <u>Range Asset</u> & <u>Cost</u> inputs
- Dilemma
  - Fleet operators know what training was accomplished
  - Ranges know what assets were used
  - OPNAV knows the cost of both
- Goal is to capture what all three know (make the lines connect)



Readiness Dependencies

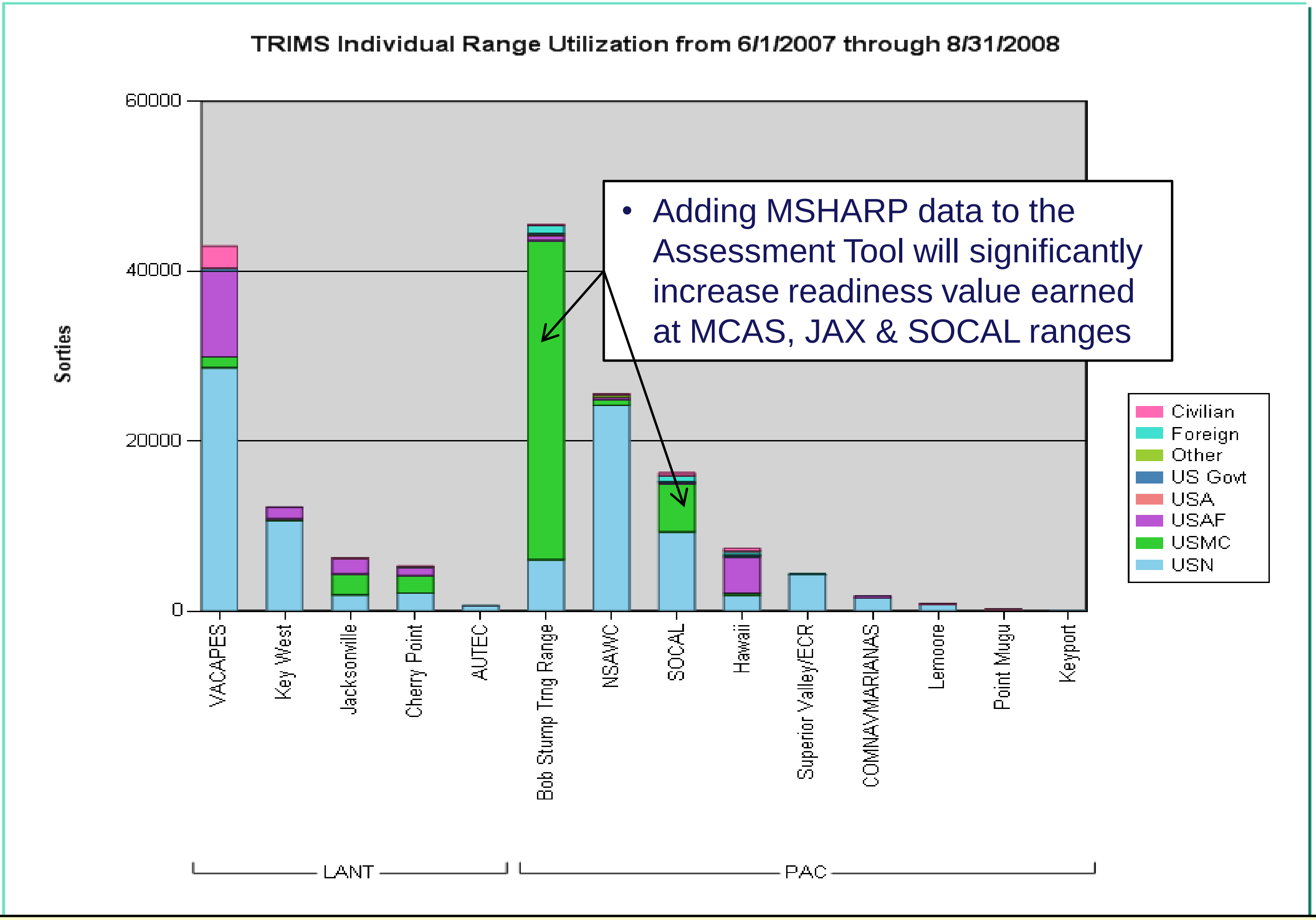
Readiness carries a great deal of weight inside the "Beltway"

Assessment Tool

'Cost of Readiness Earned from Range Use'

- Assessment Tool Description
  - Web based database able to build reports real-time to support various data views and assessment parameters
  - Uses existing data sources to assess range 'value'
  - Data types include:
    - Utilization data for Ranges and OPAREAs/Warning Areas
    - Range Operations Support (ROS) Cost
    - Training Readiness and Proficiency data
  - Data sources include:
    - Target & Range Information Management System (TRIMS)
    - Zero Base Budget Review (ZBBR) Cost
    - Sierra Hotel Aviation Readiness Program (SHARP)
    - Status of Resources & Training (SORTS)
    - DoD Readiness Reporting System (DRRS)

Range Users



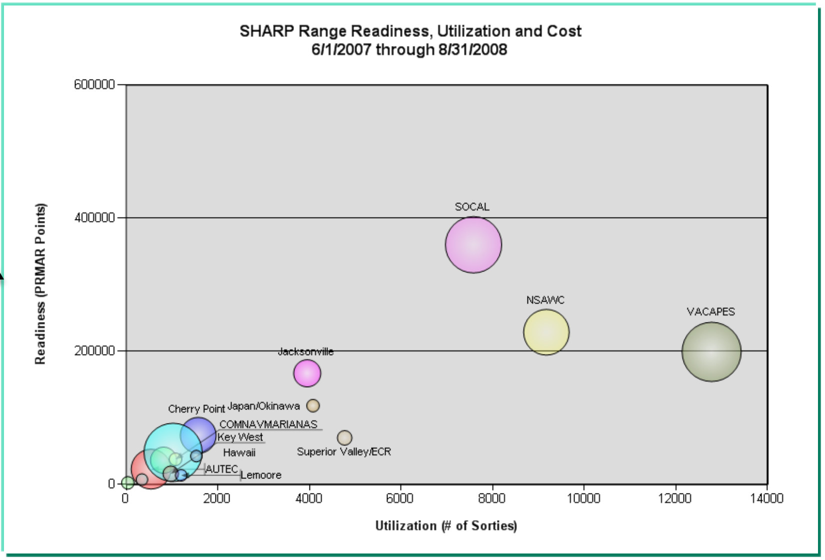
•Range reporting system provides insight into range users
•OPNAV N433 (NRO) desires a DoN solution because $$ go to USN & USMC ranges
•Linked readiness from range use data used for POM budgets & encroachment issues

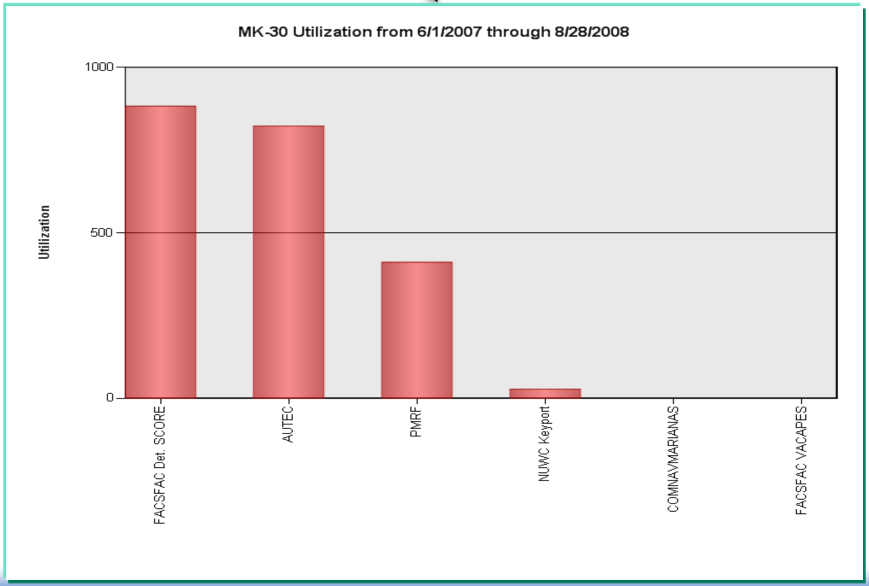
Data Insights

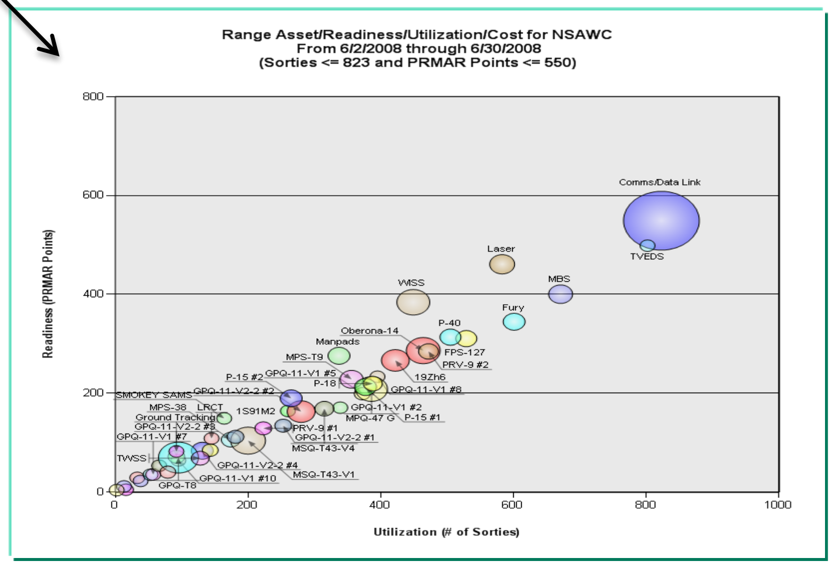
- By Range—Readiness vs Utilization & Range Cost

- By Range for specific event or exercise (CVW NFL Det)
  - Readiness by Asset & Cost

- Specific Equipment by Range

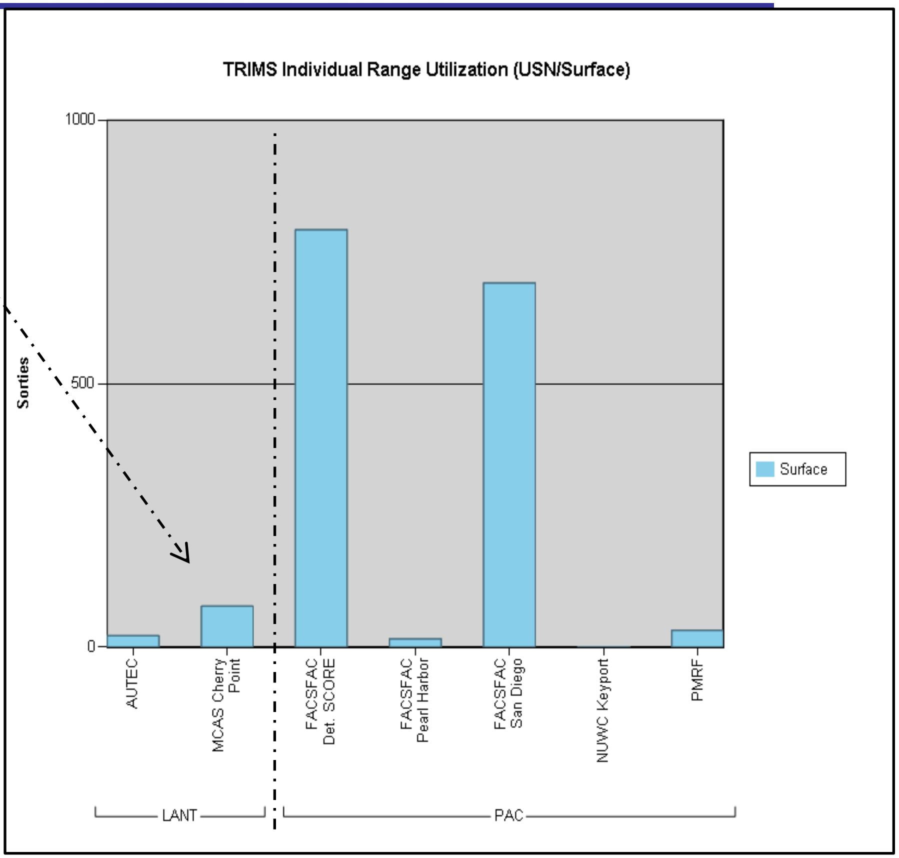






Finding - Mobile Sea Range (MSR)
Utilization not Recorded in TRIMS

- Most East Coast Surface training operations were undocumented in USFF TRIMS
  - VACAPES & JAX OPAREA daily utilization
  - Dam neck & MSR aerial & seaborne target operations
- MSR subsystems support Ship & Air events & are not in TRIMS:
  - HUGO, HUNTER, PREVAIL
  - Aerial Target Launch/Recovery
  - Seaborne Target Launch/Recovery
- > 6% of FY07 Range Operations Support (ROS) budget



N433 / WBB working with USFF to record this utilization data in to TRIMS

Mobile Sea Range (MSR)				
Training Range Operations Support (ROS) $s not in ZBBR	Who pays	FY07 ROS $s		Fleet Training Range Services Provided
VACAPES / MSR	USFF / CSFTL	$	5,010,000	Prevail & CSFTL Live Training Operations
VACAPES / MSR	USFF / CSFTL	$	555,557	CSFTL/MSR CSG/ESGEX Support; NAWC38, TWR841, NRL Pod use
VACAPES / MSR	USFF / CNAL	$	1,720,000	HUGO
VACAPES / MSR	USFF / CNAL	$	1,354,947	HUNTER
VACAPES / MSR	USFF / CNAL	$	635,617	Hugo Availability
VACAPES / MSR	USFF / CNAL	$	412,788	H Boat Upgrades
VACAPES / MSR	USFF / CNAL	$	1,127,020	PREVAIL Upgrades
VACAPES / MSR	USFF / NAVSEA	$	366,348	Seaborne Targets Support (ITT Contract)
Total FY07 MSR ROS $s		***$***	***11,182,277***	

Zero Use Assets with Significant Cost

Sched Auth ID	Range Name	Range_Name	Asset_System Name	Asset_Name
013	NSAWC	**Air/Sea space**	**Non-system**	Facilities
"	"	R-4803/B-16	"	Other costs
"	"	R-4804/B-17	**Comms/Data Link**	Radios/Voice
"	"	R-4810/B-19	"	Data Links
"	"	R-4813/B-20	"	Networks
"	"	R-4816	**Air/Surf Tracking**	TACTS
"	"	Austin MOA	"	LATR/Galaxy
"	"	Gabbs MOA	**Land Targets/TST**	Land Targets/TST
"	"	Churchill MOA	**Ordnance/ORC**	Ordnance/ORC
"	"	Ranch MOA	**Scoring Systems**	WISS
"	"	Carson MOA	"	Laser
"	"	Reno MOA	"	Strafe Scoring
"	"	-	**Link-11/16**	Link-11/16
"	"	-	**Surveillance Systems**	RASS 1
"	"	-	"	RASS 2
"	"	-	"	RASS 3
"	"	-	**EW**	19Zh6
"	"	-	"	1S91M2
"	"	-	"	ALQ-108
"	"	-	"	FPS-127
"	"	-	"	FSB-V1
"	"	-	"	GPQ-11-V1 #1
"	"	-	"	GPQ-11-V1 #2
"	"	-	"	GPQ-11-V1 #3

Range Asset Costs for NSAWC
06/01/2007 - 08/31/2008

Asset	System	Sorties	Usage	Cost
FSB-V1	EW	0	0	$23,860
GPQ-11-V1 #1	EW	432	432	$36,596
GPQ-11-V1 #10	EW	1421	1421	$18,388
GPQ-11-V1 #11	EW	952	952	$0
GPQ-11-V1 #2	EW	2166	2166	$9,621
GPQ-11-V1 #3	EW	912	912	$47,640
GPQ-11-V1 #4	EW	1050	1050	$845
GPQ-11-V1 #5	EW	3397	3397	$35,750
GPQ-11-V1 #6	EW	1500	1500	$1,826
GPQ-11-V1 #7	EW	783	783	$0
GPQ-11-V1 #8	EW	4168	4168	$0
GPQ-11-V1 #9	EW	539	539	$1,028
GPQ-11-V10 #1	EW	13	13	$42,761
GPQ-11-V2-2 #1	EW	1589	1589	$39,958
GPQ-11-V2-2 #2	EW	3016	3016	$442,658
GPQ-11-V2-2 #3	EW	1015	1015	$63,860
GPQ-11-V2-2 #4	EW	3101	3101	$406,951
GPQ-11-V3 #1	EW	3123	3123	$69,419
GPQ-11-V6 #1	EW	219	219	$20,578
GPQ-T8	EW	1096	1096	$985,281
Ground Tracking	Air/Surf Tracking	671	671	$0
I-TWS	EW	613	613	$812,307
Land Targets, TST	Land Targets/TST	0	0	$1,102,626
Laser	Scoring Systems	5195	5277	$277,954

Steps to an automated, repeatable process

Developed master asset list by range

Improved data & linking ability = 'Credible Data'

Collected utilization, cost & readiness (value) data in to one repository

Created 'Tool' to help OPNAV assess cost vs. value of OPNAV range funding

ROS Funding Outside of ZBBR

Line #	Range Operations $upport not in ZBBR	Who pays	12-mo ROS $s	What this pays for
47	VACAPES / MSR	USFF / CSFTL / MSR	$5,010,000	Prevail & CSFTL Live Training Operations
48	VACAPES / MSR	USFF / CSFTL / MSR	$555,557	CSFTL/MSR Exercise Support (CSG/ESGEX); includes use of NAWC 38, TWR 841, NRL Pods
49	VACAPES / MSR	USFF / CNAL / MSR	$1,720,000	Hugo
50	VACAPES / MSR	USFF / CNAL / MSR	$1,354,947	Hunter
51	VACAPES / MSR	USFF / CNAL / MSR	$635,617	Hugo Availability
52	VACAPES / MSR	USFF / CNAL / MSR	$412,788	H Boat Upgrades
53	VACAPES / MSR	USFF / CNAL / MSR	$1,127,020	PREVAIL Upgrades
54				
55				
56	SCORE	CPF Keyport MK-30 Depot Support	$159,334	$26000k + $133334 depot support MK-30 PAC operations - 1C/4C funds (adds 1/3 Japan/Oki MK-30 $s)
57	PMRF	CPF Keyport MK-30 Depot Support	$159,334	$26000k + $133334 depot support MK-30 PAC operations - 1C/4C funds (adds 1/3 Japan/Oki MK-30 $s)
58	Nanoose	CPF Keyport MK-30 Depot Support	$79,666	$26000k + $66666 depot support MK-30 PAC operations - 1C/4C funds (adds 1/6 Japan/Oki MK-30 $s)
59	Dabob Bay	CPF Keyport MK-30 Depot Support	$79,666	$26000k + $66666 depot support MK-30 PAC operations - 1C/4C funds (adds 1/6 Japan/Oki MK-30 $s)
60	Nanoose	CNAP	$285,000	Fleet Use of Nanoose VISTA - 1C/4C funds
61	PMRF	CNAP	$285,000	Fleet Use of PMRF VISTA - 1C/4C funds
62	SCORE	CPF MK-30 ROS $s SCORE	$2,246,000	MK-30 lines at SCORE & contract admin - 1C/4C funds
63	PMRF	CPF MK-30 ROS $s PMRF	$2,323,500	MK-30 lines at PMRF & contract admin - 1C/4C funds
64	Nanoose	CPF MK-30 ROS $s Keyport/Nanoose	$65,000	MK-30 lines at Nanoose & contract admin - 1C/4C funds
65	Dabob Bay	CPF MK-30 ROS $s Keyport/Dabob Bay	$65,000	MK-30 lines atDabob Bay & contract admin - 1C/4C funds
66	COMNAVMARIANAS	CPF MK-30s ***	$322,500	MK-30 lines at Guam & contract admin - 1C/4C funds
67				
68				
69	*FACSFAC VACAPES (Dare)*	*RCMP/ORC*	*$333,333*	ORC/RCMP/Sustainment / 0204571N
70	*MCAS Cherry Point*	*RCMP/ORC*	*$333,333*	ORC/RCMP/Sustainment / 0204571N
71	*FACSFAC Jacksonville*	*RCMP/ORC*	*$333,333*	ORC/RCMP/Sustainment / 0204571N
72	*NSAWC*	*CPF RCMP/ORC*	*$1,038,782*	ORC/RCMP/Sustainment / 0204571N
73	*SCORE*	*CPF RCMP/ORC*	*$113,136*	ORC/RCMP/Sustainment / 0204571N
74	*NAF El Centro*	*CPF RCMP/ORC*	*$547,077*	ORC/RCMP/Sustainment / 0204571N
75	*Whidbey/Boardman*	*CPF RCMP/ORC*	*$193,954*	ORC/RCMP/Sustainment / 0204571N
76	*PMRF/Kaula Rock*	*CPF RCMP/ORC*	*$96,174*	ORC/RCMP/Sustainment / 0204571N
77	*COMNAVMARIANAS/FDM*	*CPF RCMP/ORC*	*$155,204*	ORC/RCMP/Sustainment / 0204571N
78	*Jima*	*CPF RCMP/ORC*	*$80,884*	ORC/RCMP/Sustainment / 0204571N
114	Electronic Combat Range	CNAP	$1,000,000	China Lake EW Range
115				
116	Superior Valley	CNAP / Event Direct Cost$	$650,000	Annual amount paid by CNAF - 1C4C funds
117				
118	Dare (VACAPES)	Government Salaries	$585,030	(supplied from USFF/Kim M email 1/4/08)
119				
120	FACSFAC JAX	Government Salaries (JAX/PNC)	$293,898	(supplied from USFF/Kim M email 1/4/08)
121				
122	SCORE	TWR	$720,000	TWR annual costs (supplied by SCORE/Heidi)
		Totals =	$51,375,596	

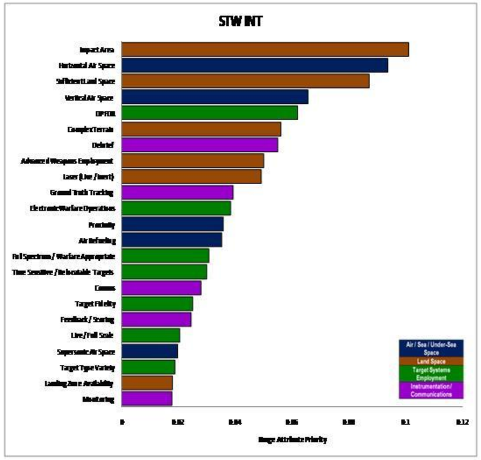
Oct '06 – $12M of $180M budget connected to specific ranges & assets
Oct '08 - $166M of $180M budget connected to specific ranges & assets
Oct '08 - Another ~$14M in Program Management & 'Other' costs

Quality of Training

- Difficult to quantify but very important
  - Range attributes (e.g. airspace, targets, debrief capability, cadre of professional instructors and adversaries, etc.)
  - Capability to host Large Force Exercises as well as Unit Level events
  - Accessibility (scheduling, distance from home base)
  - Mission (STW, AAW, CCC, ASU...)
- Decision Support Tools to quantify “Quality”

STW INT Range Attributes Assessment

Training Range Attribute		Attribute Priority
Air / Sea / Under-Sea Space	Supersonic Air Space	0.0197
	Air Refueling	0.0352
	Horizontal Air Space	0.0937
	Vertical Air Space	0.0655
	Proximity	0.0357
Land Space	Impact Area	0.1011
	Laser (Live / Inert)	0.0491
	Sufficient Land Space	0.0870
	Advanced Weapons Employment	0.0499
	Complex Terrain	0.0561
	Landing Zone Availability	0.0179
Target Systems Employment	Time Sensitive / Relocatable Targets	0.0299
	Target Fidelity	0.0249
	Full Spectrum / Warfare Appropriate	0.0306
	Target Type Variety	0.0188
	Live / Full Scale	0.0204
	Electronic Warfare Operations	0.0383
	OPFOR	0.0618
Instrumentation / Communications	Ground Truth Tracking	0.0393
	Monitoring	0.0177
	Debrief	0.0550
	Feedback / Scoring	0.0244
	Comms	0.0278

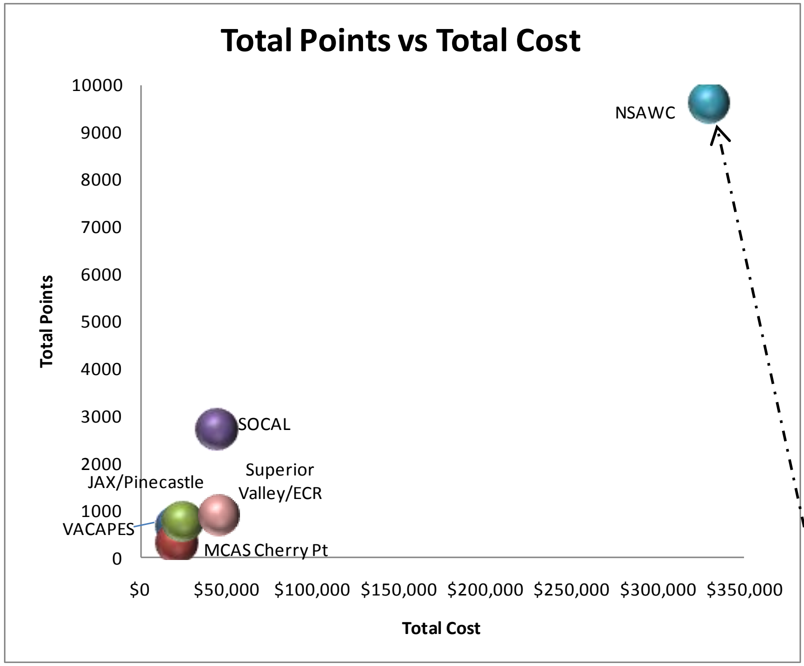


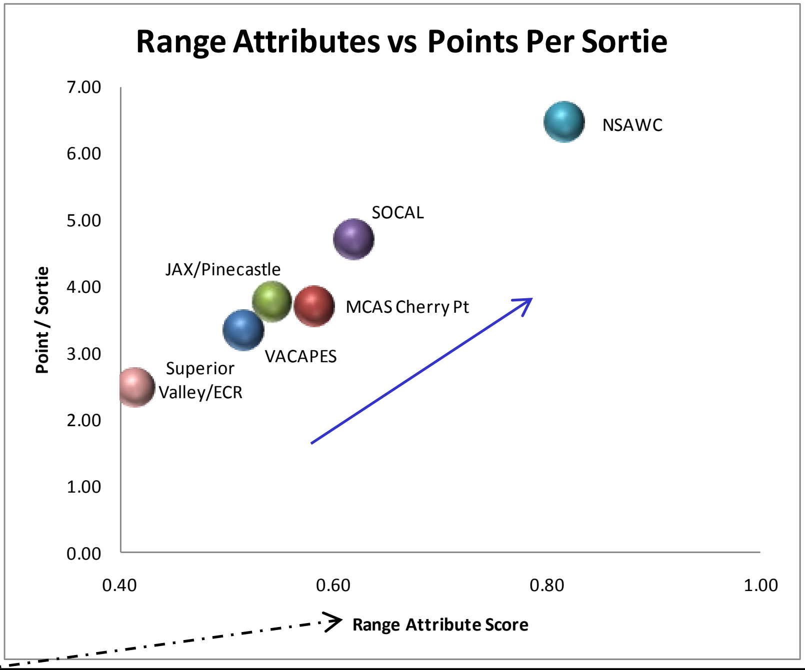
STW INT Range Attributes Assessment

Training Range Attribute		Attribute Priority	VACAPES	MCAS Cherry Pt	JAX / Pinecastle	SOCAL	NSAWC	Superior Valley / ECR
Air / Sea / Under-Sea Space	Supersonic Air Space	0.0197	0.8028	0.7324	0.7219	0.7916	0.6267	0.2084
	Air Refueling	0.0352	0.8322	0.7831	0.7374	0.8322	0.7327	0.3631
	Horizontal Air Space	0.0937	0.7666	0.6659	0.5868	0.8572	0.8410	0.4024
	Vertical Air Space	0.0655	0.6439	0.6325	0.5410	0.7483	0.6122	0.4490
	Proximity	0.0357	0.9411	0.7119	0.5589	0.8867	0.8919	0.5337
Land Space	Impact Area	0.1011	0.3551	0.5143	0.6684	0.5059	0.8389	0.4096
	Laser (Live / Inert)	0.0491	0.4957	0.7374	0.6149	0.5422	0.8042	0.3849
	Sufficient Land Space	0.0870	0.2679	0.3933	0.3805	0.4469	0.8715	0.4229
	Advanced Weapons Employment	0.0499	0.3438	0.3575	0.4033	0.6441	0.7121	0.1867
	Complex Terrain	0.0561	0.1884	0.3230	0.3534	0.3292	0.7960	0.4493
	Landing Zone Availability	0.0179	0.3743	0.6533	0.6099	0.5205	0.8490	0.3093
Target Systems Employment	Time Sensitive / Relocatable Targets	0.0299	0.3857	0.5155	0.4493	0.4401	0.7552	0.2510
	Target Fidelity	0.0249	0.3076	0.4798	0.5586	0.4062	0.7920	0.3907
	Full Spectrum / Warfare Appropriate	0.0306	0.4864	0.4811	0.5129	0.6327	0.8450	0.4697
	Target Type Variety	0.0188	0.4139	0.5410	0.5026	0.5013	0.7655	0.4171
	Live / Full Scale	0.0204	0.3233	0.3944	0.4264	0.4719	0.7287	0.2640
	Electronic Warfare Operations	0.0383	0.3722	0.5920	0.4340	0.5738	0.8797	0.6764
	OPFOR	0.0618	0.5741	0.5920	0.5133	0.5920	0.9161	0.3708
Instrumentation / Communications	Ground Truth Tracking	0.0393	0.6123	0.6888	0.5410	0.6623	0.8715	0.3180
	Monitoring	0.0177	0.7574	0.8113	0.6609	0.8278	0.8715	0.5481
	Debrief	0.0550	0.6712	0.7321	0.5664	0.7074	0.9510	0.4550
	Feedback / Scoring	0.0244	0.4583	0.7119	0.6330	0.5581	0.8185	0.4929
	Comms	0.0278	0.7666	0.8113	0.7781	0.8572	0.8225	0.7464
	Total Range Attributes Score		0.5159	0.5826	0.5431	0.6199	0.8171	0.4140

0.74489796	Full Capability
0.33673469	Medium Capability
0.08923469	Low Capability
	Very Low Capability

STW Integrated (INT)
Range Comparison – PRMAR Points vs Cost





Higher quality of training and readiness result from a > range attribute prioritization score (capability to meet Mission Area/Phase of Training)

Extensive investment in NSAWC range areas & instrumentation provides high quality of training and readiness to CVWs

- NSAWC CVWNFL exercise required for all east and west coast CVWs during Integrated training phase
- SOCAL OPAREAs & Ranges are used west coast CSG/CVW COMPTUEX training with some long-range strike missions to NSAWC & Superior Valley/ECR
- MCAS Cherry Point and JAX/Pinecastle used for all east coast COMPTUEX exercises

BackUp Slides

Data Collection & Linkage Improvements
2006 - 2008

ROS $s - NSAWC Threat Radar Engagement Systems (TRES) 10/01/2004 - 06/30/2006			
TRES Use & ROS $s	EW	32604	$1,270,778

ROS $s - NSAWC Threat Radar Engagement Systems (TRES) 06/01/2007 - 08/31/2008			
GPQ-11-V1 #1	EW	432	$36,596
GPQ-11-V1 #10	EW	1421	$18,388
GPQ-11-V1 #11	EW	952	$0
GPQ-11-V1 #2	EW	2166	$9,621
GPQ-11-V1 #3	EW	912	$47,640
GPQ-11-V1 #4	EW	1050	$845
GPQ-11-V1 #5	EW	3397	$35,750
GPQ-11-V1 #6	EW	1500	$1,826
GPQ-11-V1 #7	EW	783	$0
GPQ-11-V1 #8	EW	4168	$0
GPQ-11-V1 #9	EW	539	$1,028
GPQ-11-V10 #1	EW	13	$42,761
GPQ-11-V2-2 #1	EW	1589	$39,958
GPQ-11-V2-2 #2	EW	3016	$442,658
GPQ-11-V2-2 #3	EW	1015	$63,860
GPQ-11-V2-2 #4	EW	3101	$406,951
GPQ-11-V3 #1	EW	3123	$69,419
GPQ-11-V6 #1	EW	219	$20,578
GPQ-T8	EW	1096	$985,281
Total FY07 TRES Use & ROS $s		30492	$2,223,159

Zero Use Assets with Significant Cost

Sched Auth ID	Range Name	Range_Name	Asset_System Name	Asset_Name
013	NSAWC	**Air/Sea space**	**Non-system**	Facilities
"	"	R-4803/B-16	"	Other costs
"	"	R-4804/B-17	**Comms/Data Link**	Radios/Voice
"	"	R-4810/B-19	"	Data Links
"	"	R-4813/B-20	"	Networks
"	"	R-4816	**Air/Surf Tracking**	TACTS
"	"	Austin MOA	"	LATR/Galaxy
"	"	Gabbs MOA	**Land Targets/TST**	Land Targets/TST
"	"	Churchill MOA	**Ordnance/ORC**	Ordnance/ORC
"	"	Ranch MOA	**Scoring Systems**	WISS
"	"	Carson MOA	"	Laser
"	"	Reno MOA	"	Strafe Scoring
"	"	-	**Link-11/16**	Link-11/16
"	"	-	**Surveillance Systems**	RASS 1
"	"	-	"	RASS 2
"	"	-	"	RASS 3
"	"	-	**EW**	19Zh6
"	"	-	"	1S91M2
"	"	-	"	ALQ-108
"	"	-	"	FPS-127
"	"	-	"	FSB-V1
"	"	-	"	GPQ-11-V1 #1
"	"	-	"	GPQ-11-V1 #2
"	"	-	"	GPQ-11-V1 #3

Range Asset Costs for NSAWC
06/01/2007 - 08/31/2008

Asset	System	Usage	Cost
Corona Support	Non-system	0	$52,870
Facilities	Facilities	0	$1,212,893
FSB-V1	EW	0	$23,860
Land Targets, TST	Land Targets/TST	0	$1,102,626
LATR/Galaxy	Air/Surf Tracking	0	$0
MRES	EW	0	$49,610
RCMP/ORC	Ordnance/ORC	0	$1,298,478
TPT-T3 (MTES)	EW	0	$4,504

Steps to an automated, repeatable process

Developed master asset list by range

Improved data & linking ability = 'Credible Data'

Collected utilization, cost & readiness (value) data in to one repository

Created 'Tool' to help OPNAV assess cost vs. value of OPNAV range funding

Common Range Integrated Instrumentation System (CRIIS)

National Defense Industrial Association

46th Annual Targets, UAVs & Range Operations Symposium & Exhibition

CRIIS Program Overview

October 2008

Distribution Statement A: Approved for public release. Distribution unlimited.

Mr. Mike Sorial, CRIIS Program Manager

Email: mike.sorial@eglin.af.mil

This briefing is: UNCLASSIFIED

Outline

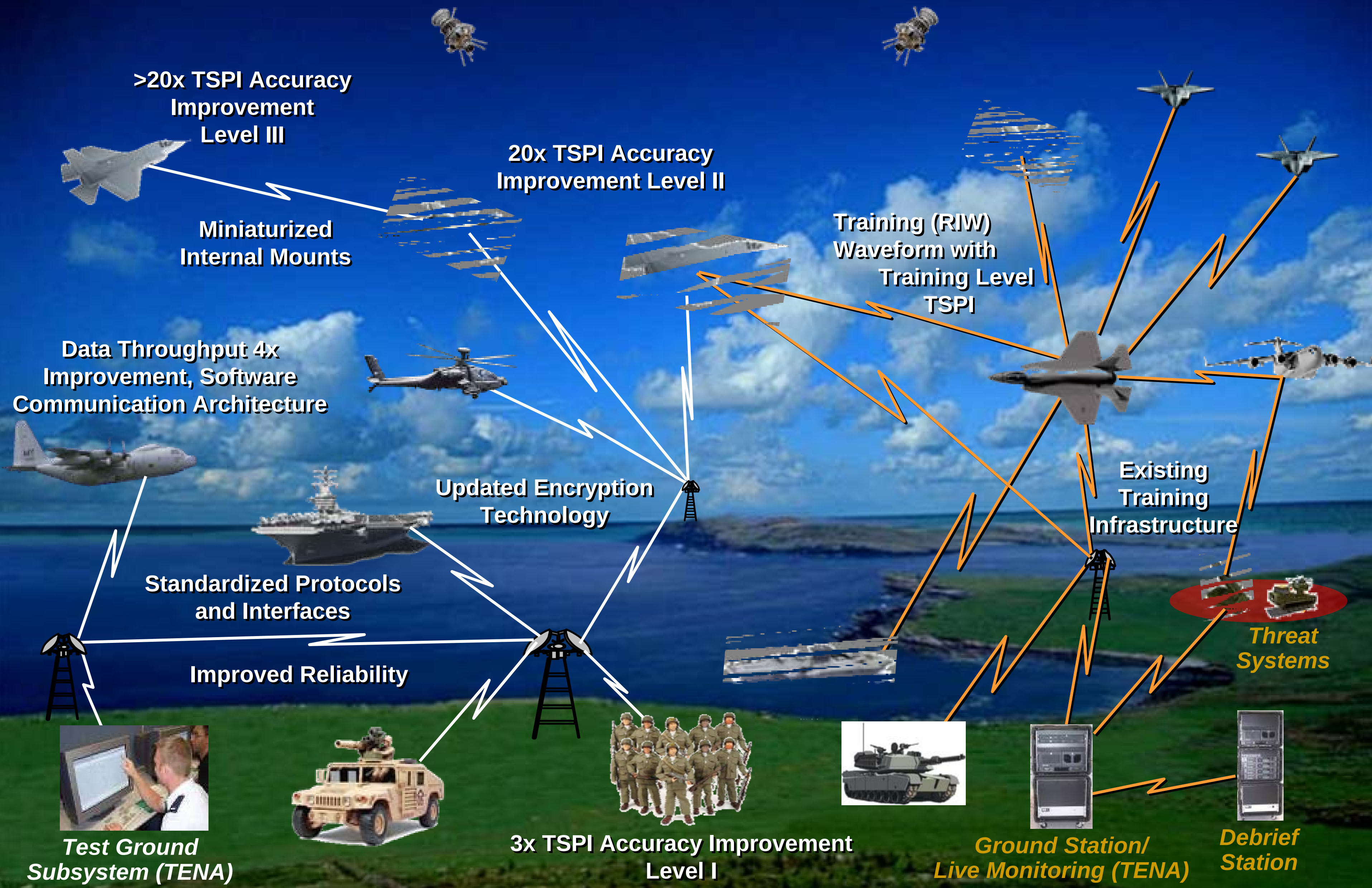
- Background
- Overview
- Acquisition Strategy
- Schedule
- Summary

Background

- CRIIS Provides Non-Tactical Test Range Data Collection:
  - High Accuracy Time, Space, Position Information (TSPI)
  - Secure Data Link(s) Transmit Real Time TSPI and Aircraft Data
    - Avionics, Weapons Targeting and Status Data, Aircraft Status
- Supports Land, Sea, and Airborne Platforms
- Central Test & Evaluation Investment Program (CTEIP) Funded Development
  - Production Funded by Tri-Services
- Range Need
  - Replaces Aging Advanced Range Data System (ARDS)
  - Compatible with Next Generation Platforms

CRIIS is A Test Range Instrumentation Replacement of the Existing GPS Based ARDS With Advanced Data Link , TSPI, Security Features

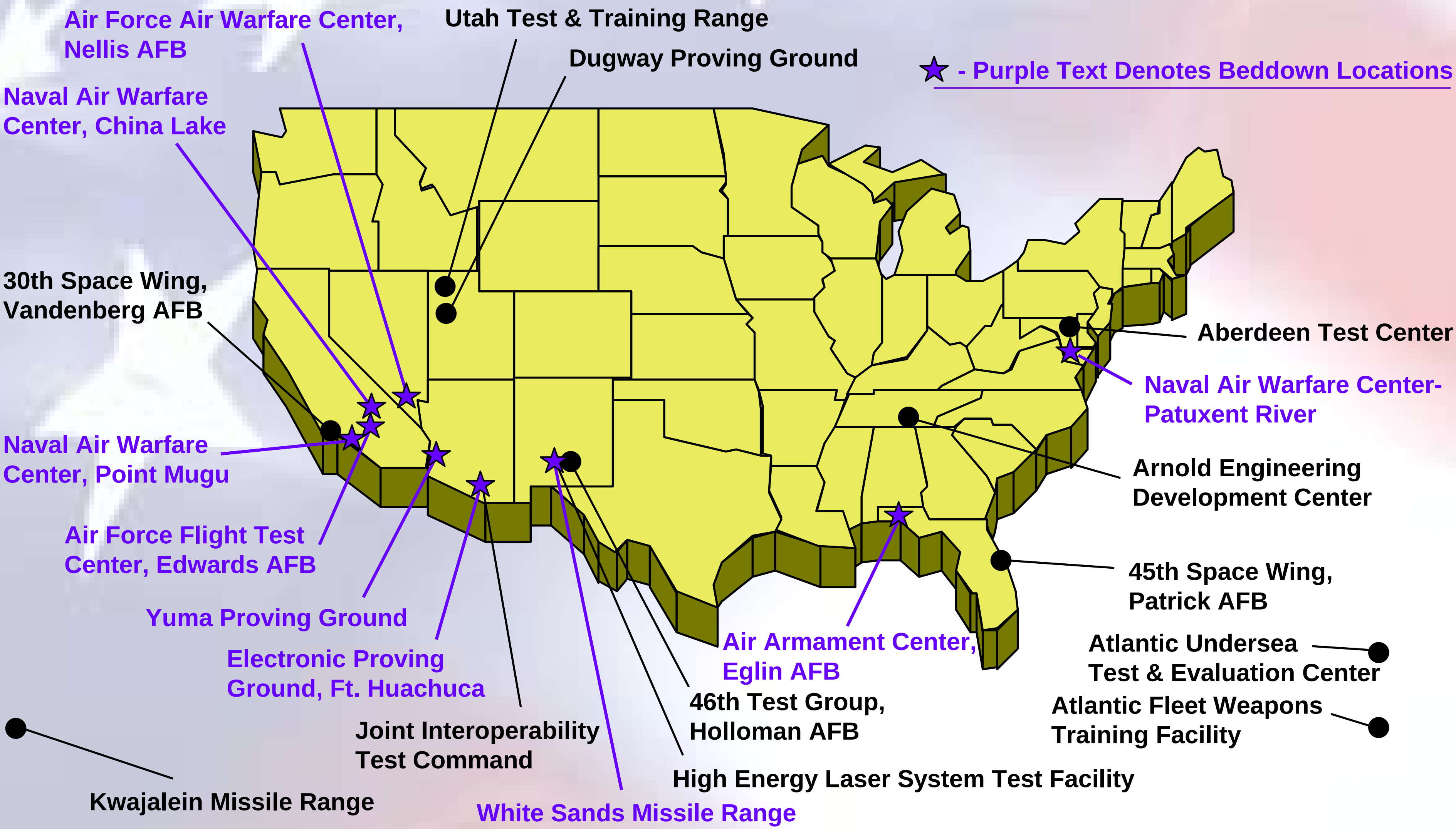
Project Overview - CRIIS



Test Package Directive (TPD) Issued 31 Jan 08

96ABW/PA#10-03-08-451

Major Range and Test Facility Base (MRTFB) and Initial Beddown Locations



Functional Configurations

INCREMENT 1
Configurations 1, 2, 3

Level IA TSPI

Short Range DL

Config. 1
Dismounted Soldier

Level IB TSPI

Mid Range DL

Encryption

Config. 2
Low Dynamic Vehicles

Config. 3
Ship-to-Shore

Level IB TSPI

Extended Range DL

INCREMENT 2
Configurations 4, 5, 6

Level II TSPI

High Throughput DL

Encryption

Config. 4 Pod

Config. 5   Moderate Accuracy
Multi-Package Internal Mount

Config. 6   Moderate Accuracy
Single Package Internal Mount

RIW/Training Hooks

INCREMENT 3
Configurations 7, 8

Config. 7   High Accuracy
Multiple-Package Internal Mount

Level III TSPI

High Throughput DL

Encryption

Config. 8   High Accuracy
Single Package Internal Mount

Ground Subsystem

Architecture Approach

TSPI Building Blocks	DATALINK Building Blocks	OTHER Building Blocks	Common Framework
Level I A	Short Range	Encryption Device (RIW)	Mechanical Interface
Level I B	Mid Range	Recorders	Electrical Interface
Level II (Absolute Mode)	Extended Range	Participant Interface Controller	Data Formats & Protocols
Level III	High Throughput	Other Training Hooks (RTKN, Weapon Sims)	

Dismounted Soldier
Configuration #1

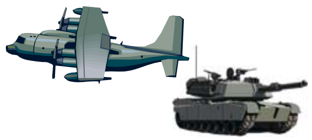
COMMON FRAMEWORK

- Level I A
- Short Range
- Recorders
- Participant Interface Controller

Low-Dynamic Vehicle
Configuration #2

COMMON FRAMEWORK

- Level I B
- Mid Range
- Encryption Device
- Recorders
- Participant Interface Controller



Ship-to-Shore
Configuration #3

COMMON FRAMEWORK

- Level I B
- Extended Range
- Recorders
- Participant Interface Controller

Moderate Accuracy
Configuration #4: POD
Configuration #5: 2-box IM
Configuration #6: 1-box IM

COMMON FRAMEWORK

- Level II (Absolute Mode)
- High Throughput (RIW)
- Encryption Device (RIW)
- Recorders
- Participant Interface Controller (RIW)
- Other Training Hooks (RTKN, Weapon Sims)

High Accuracy
Configuration #7: 2-box IM
Configuration #8: 1-box IM

COMMON FRAMEWORK

- Level III
- High Throughput
- Encryption Device
- Recorders
- Participant Interface Controller

Ground Subsystem

Acquisition Strategy

Phase I: Risk Reduction

Boeing	**Rockwell Collins**
Mature Technology to TRL 6	Mature Technology to TRL 6
Develop System Architecture	Develop System Architecture
Preliminary Design Review	Preliminary Design Review

DOWN SELECT

Phase II: SDD, Production & Sustainment

Prime Contractor

Increment 1	Increment 2	Increment 3
Configurations 1, 2, 3	Configurations 4, 5, 6	Configurations 7, 8

Common Ground Subsystem

- Risk Reduction and SDD Funded by CTEIP
- Production and Sustainment Funded by Services
- CRIIS Program Executes All Phases

CRIIS Contracts Awarded

- Two Contracts Awarded for Phase I Risk Reduction/Technology Maturation

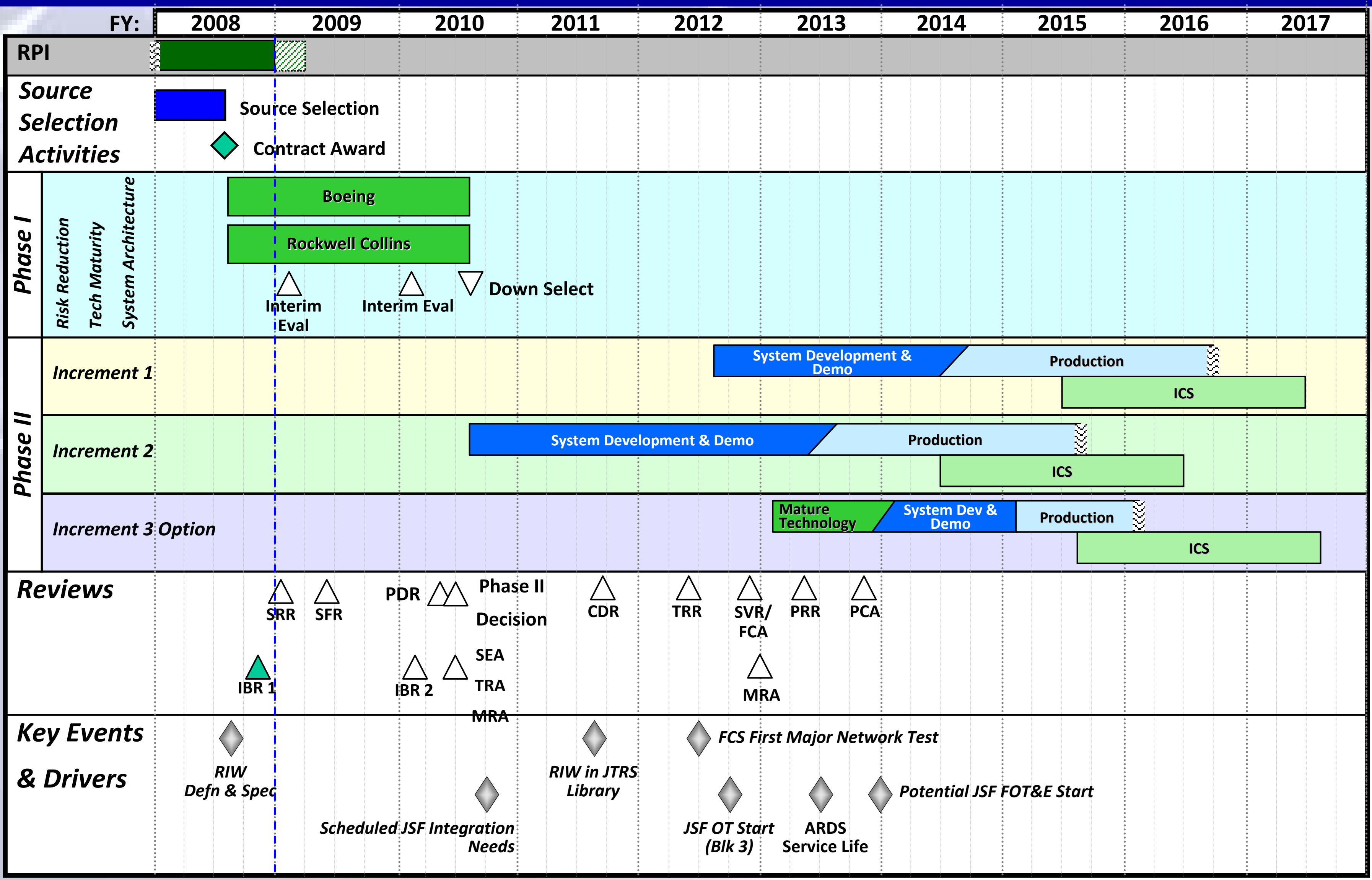
  Contractors

  – Boeing (St. Louis, MO)

  – Rockwell (Cedar Rapids, IA)

- Period of Performance: 1 May 2008 through 1 March 2010
- Acquisition Strategy Maintains Competition Through Phase I
  – CRIIS Remains in Source Selection Environment During the Two Year Period
  – Downselect to a Single Prime Contractor Planned After PDR
- Must Ensure Procurement Integrity
  – CRIIS Project Office is the Sole Voice for This Effort

Schedule Chart



96ABW/PA#10-03-08-451

As of Oct 08

Summary

- CRIIS is Funded and Executing Phase I
  - Provides Common Test Instrumentation Across Major Service Ranges
- CRIIS Technologies are Leading Edge
  - TSPI Pushing GPS Boundaries
  - Secure High Throughput, High Spectral Efficiency Data Link
- CRIIS is a Future Enabler
  - Maximizes Interoperability in Range Instrumentation Systems For T&E
  - Conducive to Live, Virtual, Constructive Applications
  - Potential Operational Use
- CRIIS is Taking First Steps in Bringing Test and Training Together

QUESTIONS ?

46th Annual Targets, UAVs, and Range Operations Symposium

Telemetry Solutions for Targets and Unmanned Aerial Vehicles (UAVs)

John Watson
October 2008




www.dynetics.com

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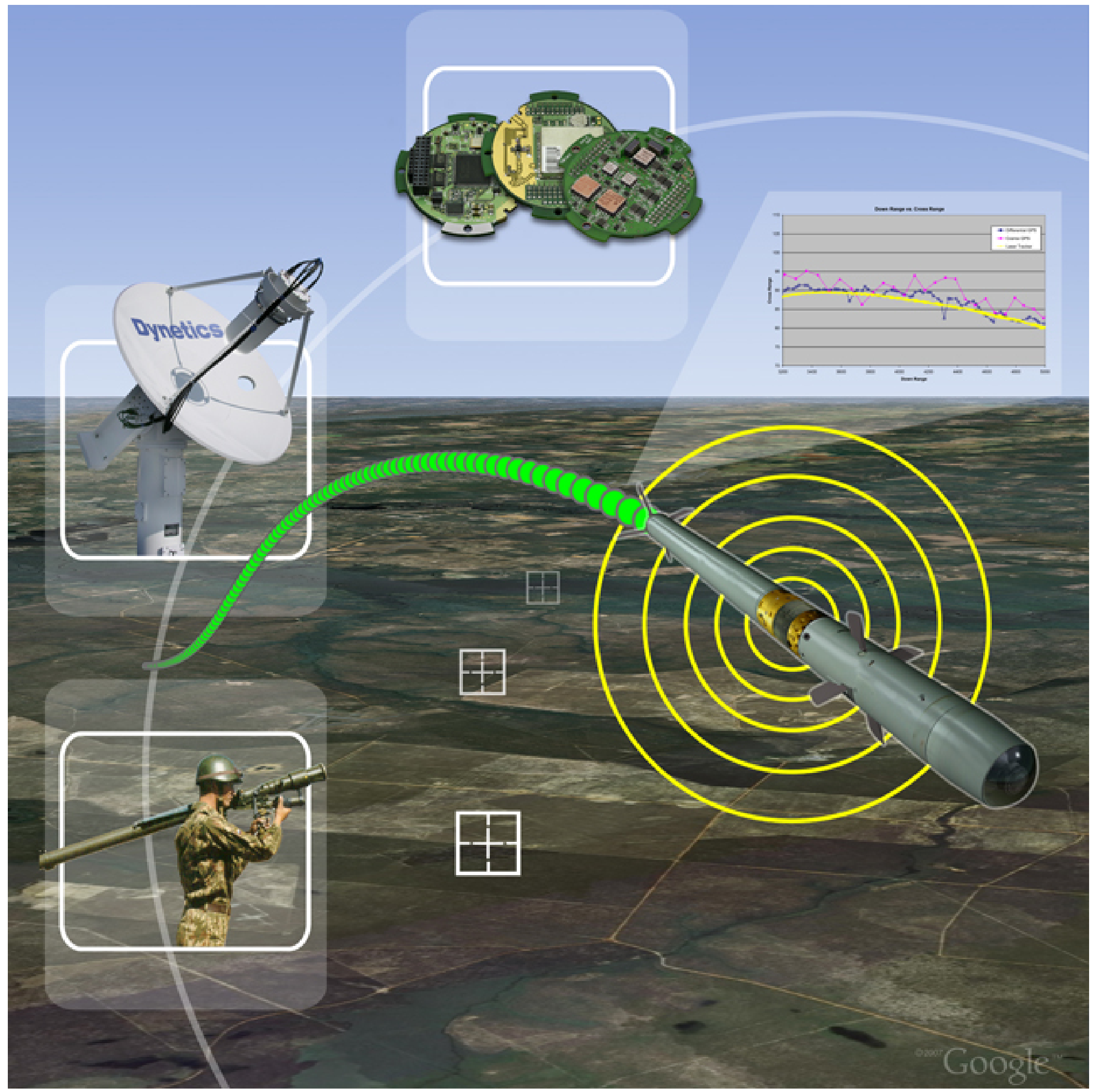
Dynetics' Legacy in Missile Test and Evaluation (T&E)

- **Dynetics' History Is Missile T&E; We Entered the Telemetry Business Because of Our Missile Expertise**
- **Our Customer Base Drove Us to Develop Missile Instrumentation That Covers a Wide Range of Applications With Minimal NRE**
- **This Means Dynetics' Instrumentation Products Must Be:**
  - **Physically Very Small…Fit Into Any Size Missile**
  - **Modular…Seamlessly Configurable**
  - **Flexible…Large Field Programmable Gate Array (FPGA)-Based Design**
  - **State-of-the-Art (SOTA)…Employ the Latest T&E Technologies**
  - **Secure…Ensure Customer Data Are Not Compromised**



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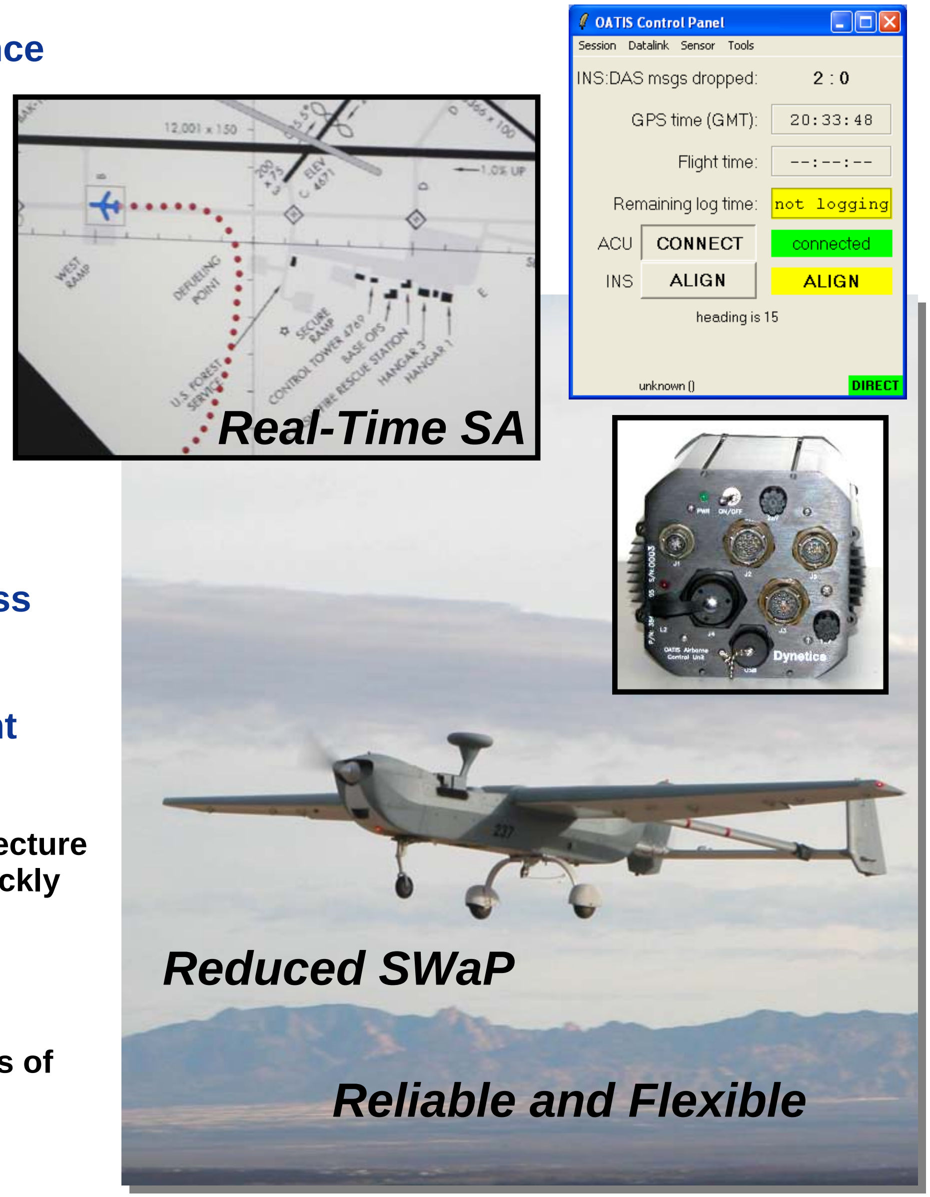
Dynetics' Legacy in UAV T&E

- **Dynetics' Background Was Flight Test, Performance Analysis, and Simulation for UAVs**
- **Quality Flight Test Data Are Critical to Support Analysis and Simulation**
- **We Expanded Into Instrumentation for UAVs Because of Our Flight Test and Analysis Work**
- **Tailored Instrumentation Solution Based on the Need for Data Products With Limited Space, Weight, and Power (SWaP)**
- **Test Equipment Has an Impact on the Effectiveness of Time on the Flight Line**
- **Dynetics' Instrumentation Products Have the Right Features: Reliability and Flexibility**
  - **Physically Small**
  - **Modular…Seamlessly Configurable, Distributed Architecture**
  - **Flexible…Powerful Onboard Software That Can Be Quickly Customized for New Capabilities**
  - **Commercial-Off-the-Shelf (COTS)…Modern Embedded Components Reduce NRE**
  - **Real-Time…Situational Awareness for Flight Test Coordination and Safety…Data Monitoring in the Hands of the Test Conductor**
  - **Remote Operation Via Bidirectional Data Link**



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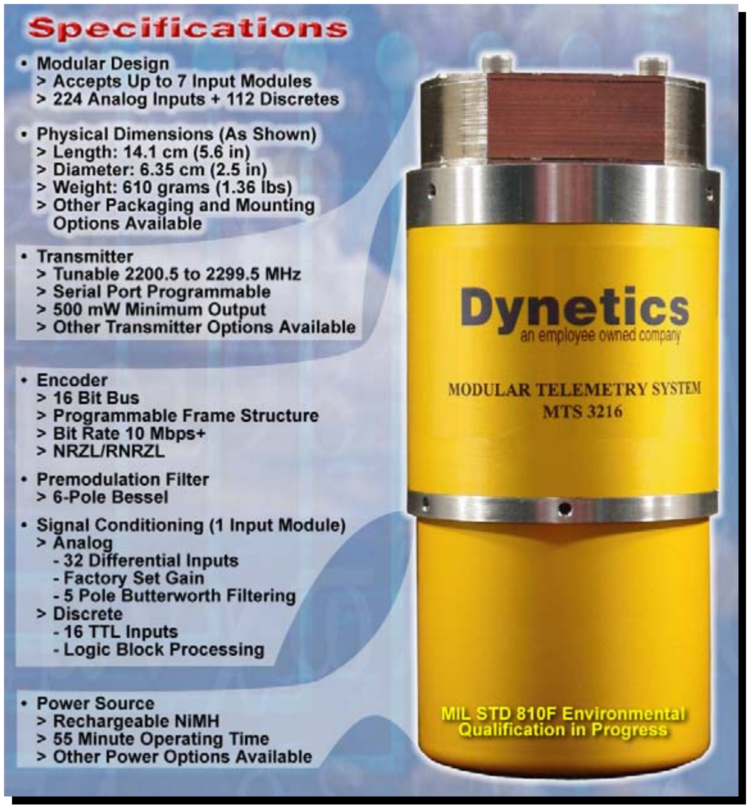
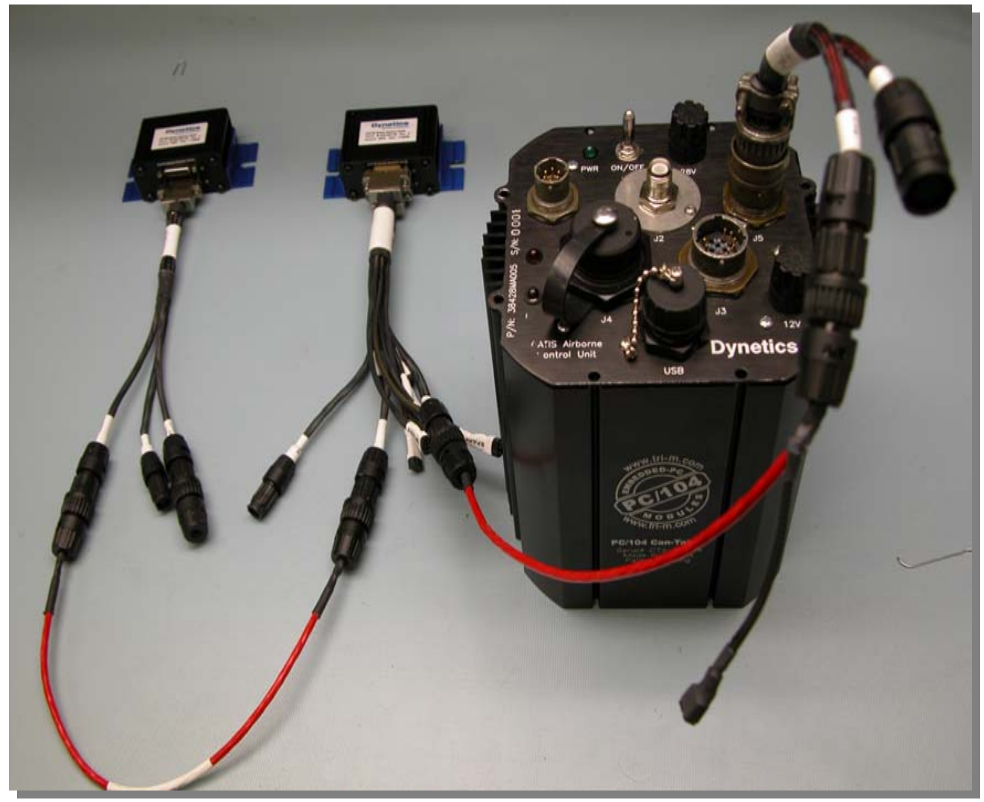
Dynetics' Telemetry Solutions

Missiles/Small Targets



Modular Instrumentation System (MIS)

Unmanned Aerial Vehicles (UAVs)



Open Architecture for Telemetry and Instrumentation System (OATIS)

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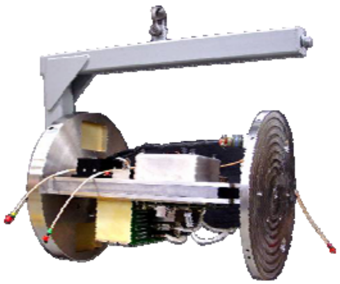
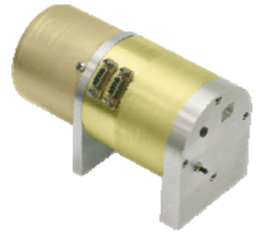
Modular Instrumentation Evolution



Medium- and Long-Range Missile Telemetry Systems

2003 Development of Miniaturized System

MANPADS Testing Occurs



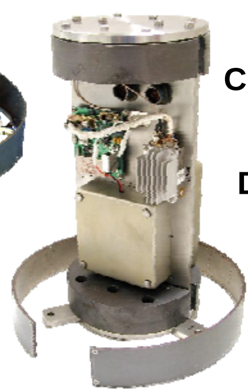
Data Logger Developed

Encryption Module Developed

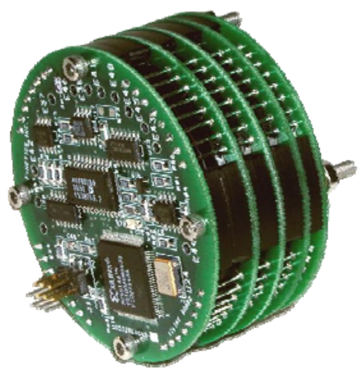
Ground Support Station

1990 The Evolution of Dynetics' MIS Program

Backup Telemetry Collection Role

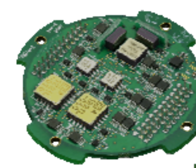


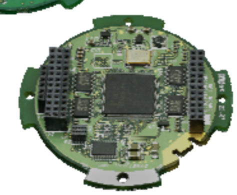
Control Test Vehicle (CTV) Developed



DHS Orders 40+ Telemetry Systems

Flight of High-Dynamic Global Positioning System (GPS) and Enhanced Inertial Measurement Unit (IMU)





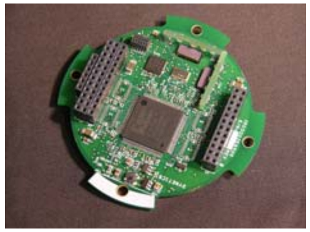
Army ASE ~40 Telemetry/GPS

Modular Telemetry System

- Compact Design
- Similar Performance/Characteristics
- Integrated IMU
- Warhead Tests Now Feasible

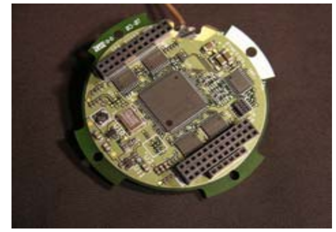
MIS

Missile Telemetry With Integrated Antennas

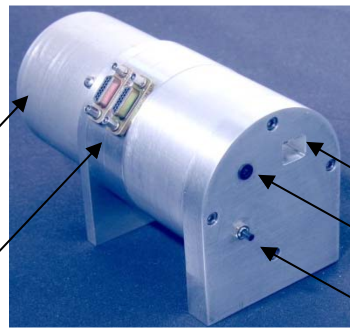


Integrated IMU Module

Radar Instrumentation With Fiber Optic Input/Output



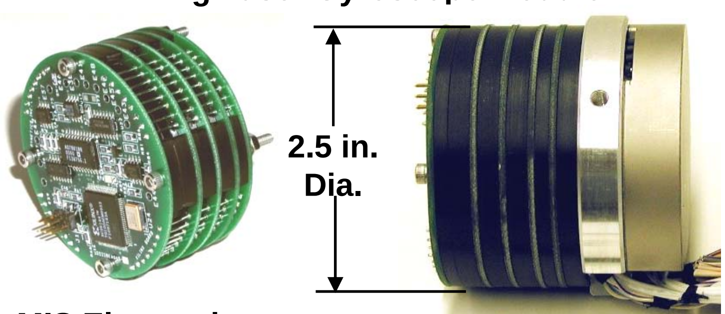
Integrated GPS Module



MIS 1216 Data Logger

Modular Telemetry System

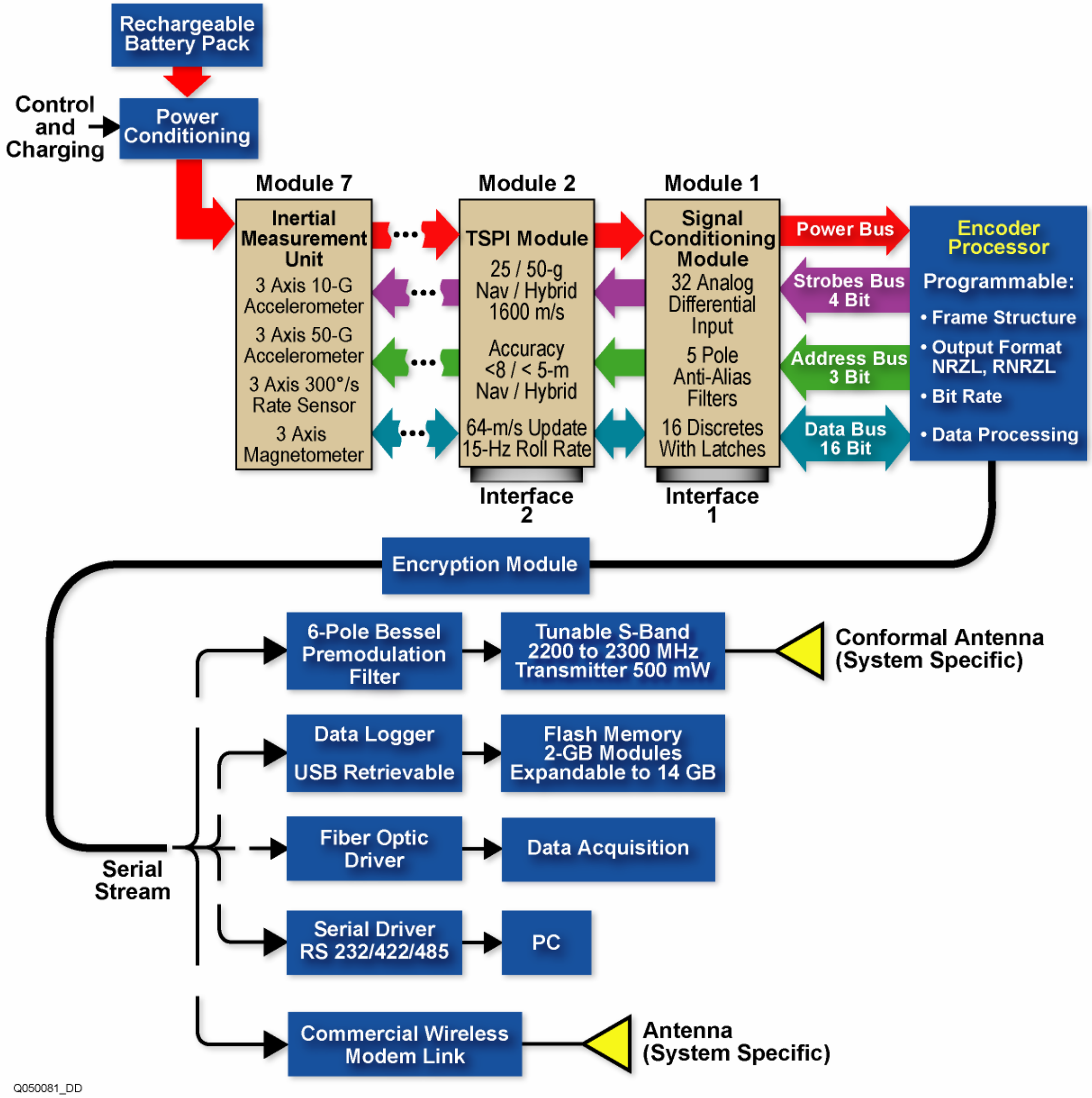
Ring Laser Gyroscope Module



MIS Electronics

Rocketball Data Logger

MIS (Continued)



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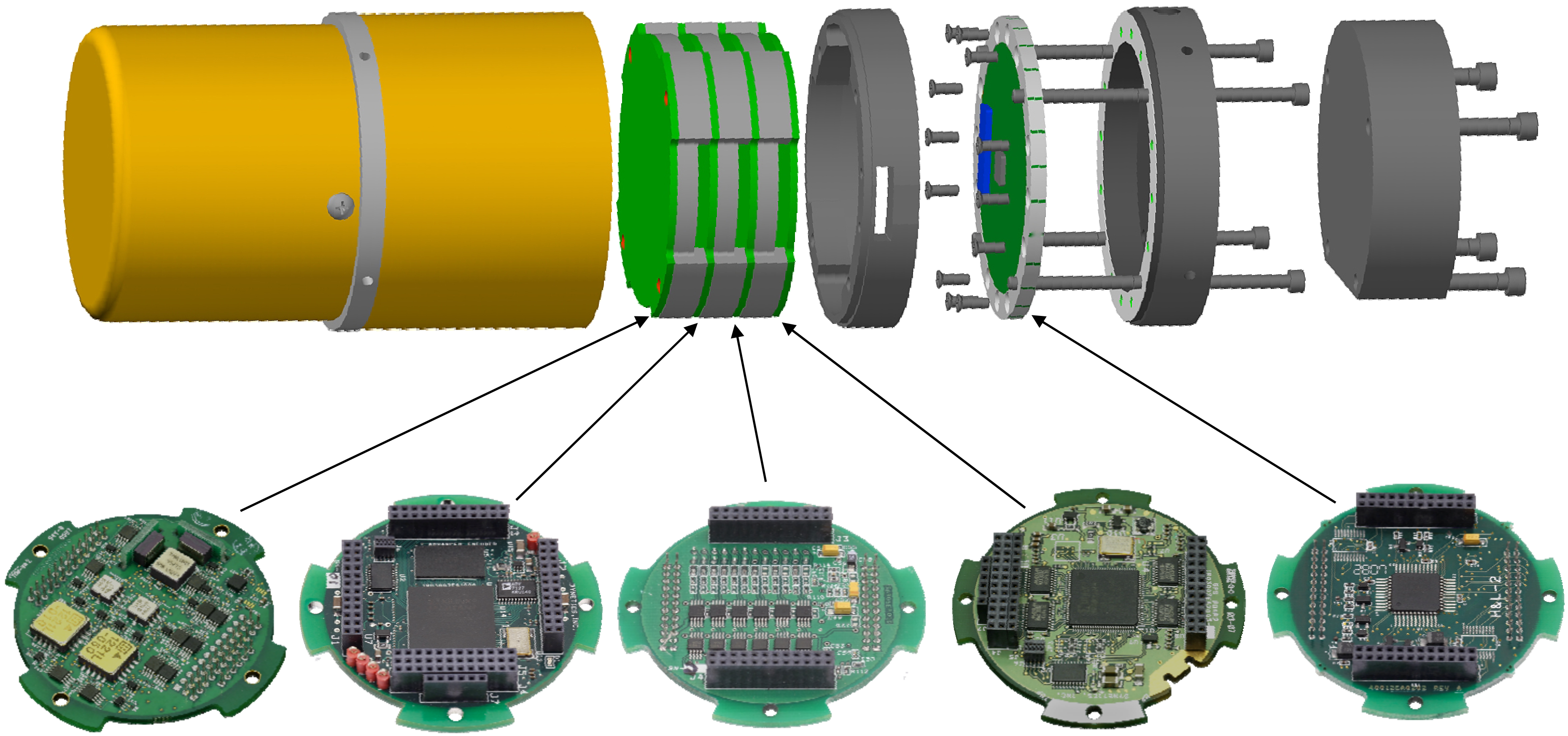
MIS (Concluded)



Enhanced IMU Module

Basic and Enhanced Encoder Module

Multipurpose Serial Input/Output Module

High-Dynamic GPS Module

Encryption Module

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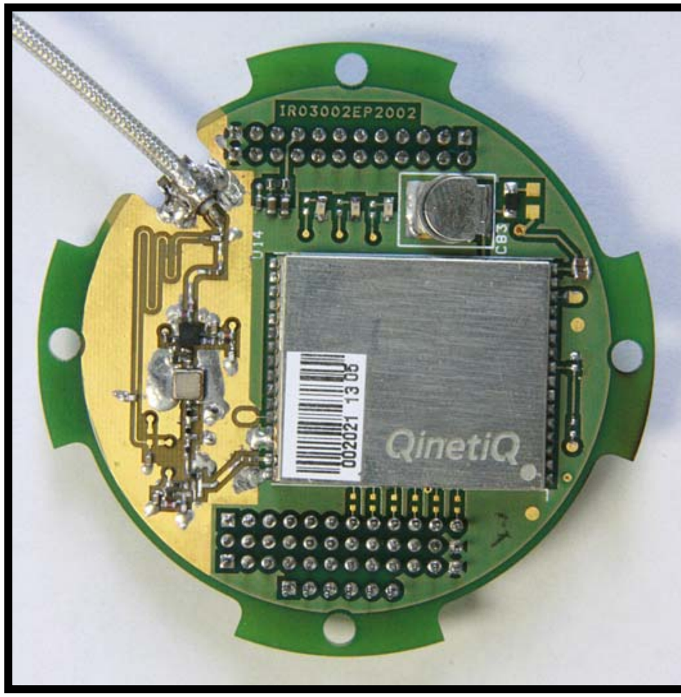
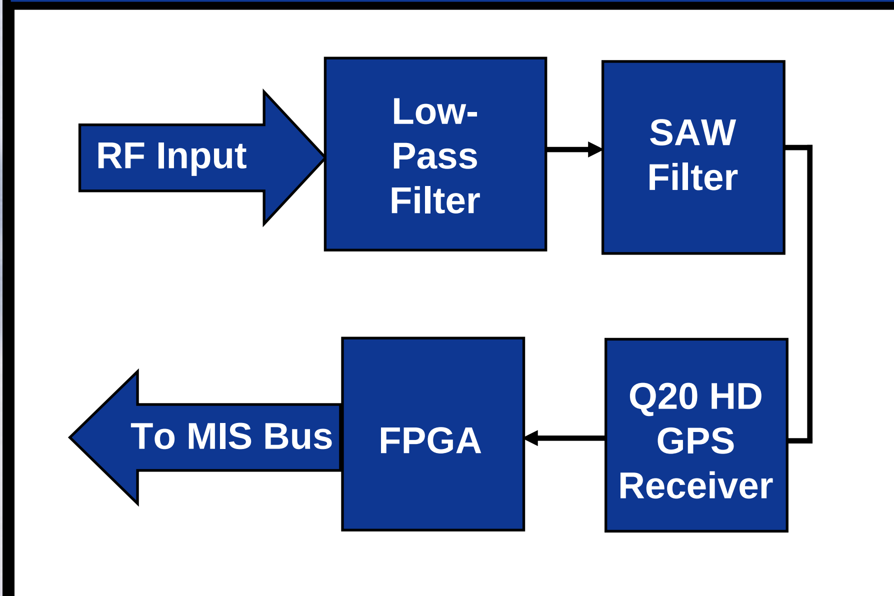
High-Dynamic GPS Receiver Module

High-Performance, State-of-the-Art, Ultra-Compact GPS Unit Providing High-Dynamic Tracking Capability



BLOCK DIAGRAM



- Onboard Real-Time GPS Positioning
- Acquisition and Tracking Under Very High Accelerations With Fast Time to First Fix
- High-Accuracy Differential Positioning Capable in Real Time or for Post-Mission Analysis
- High Update Rate: 64 ms

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GPS Operational Configurations

- **GPS Sensor Mode**
  - **8-Hz PVTM Updates (Single-Ended Navigation Solution)**
  - **15.625-Hz 8003 Updates (Onboard)**
  - **50g+ Acceleration**
  - **5000-ft/s Velocity**
  - **30-ft 3-ft/s Resolution**
  - **5-Satellite Fix in 7 s**
- **GPS Navigation Mode**
  - **8-Hz PVTM Updates**
  - **15.625-Hz MACM Updates (Onboard)**
  - **25g+ Acceleration**
  - **5000-ft/s Velocity**
  - **40-s Cold Time to First Fix**
- **Demonstrated GPS Position Accuracy**
  - **Real-Time Position Solution: 10 to 30 m**
  - **Differential Processing: 5 m**
  - **Carrier Phase Processing: < 40 cm**

Target System Instrumented With MIS Data Logger

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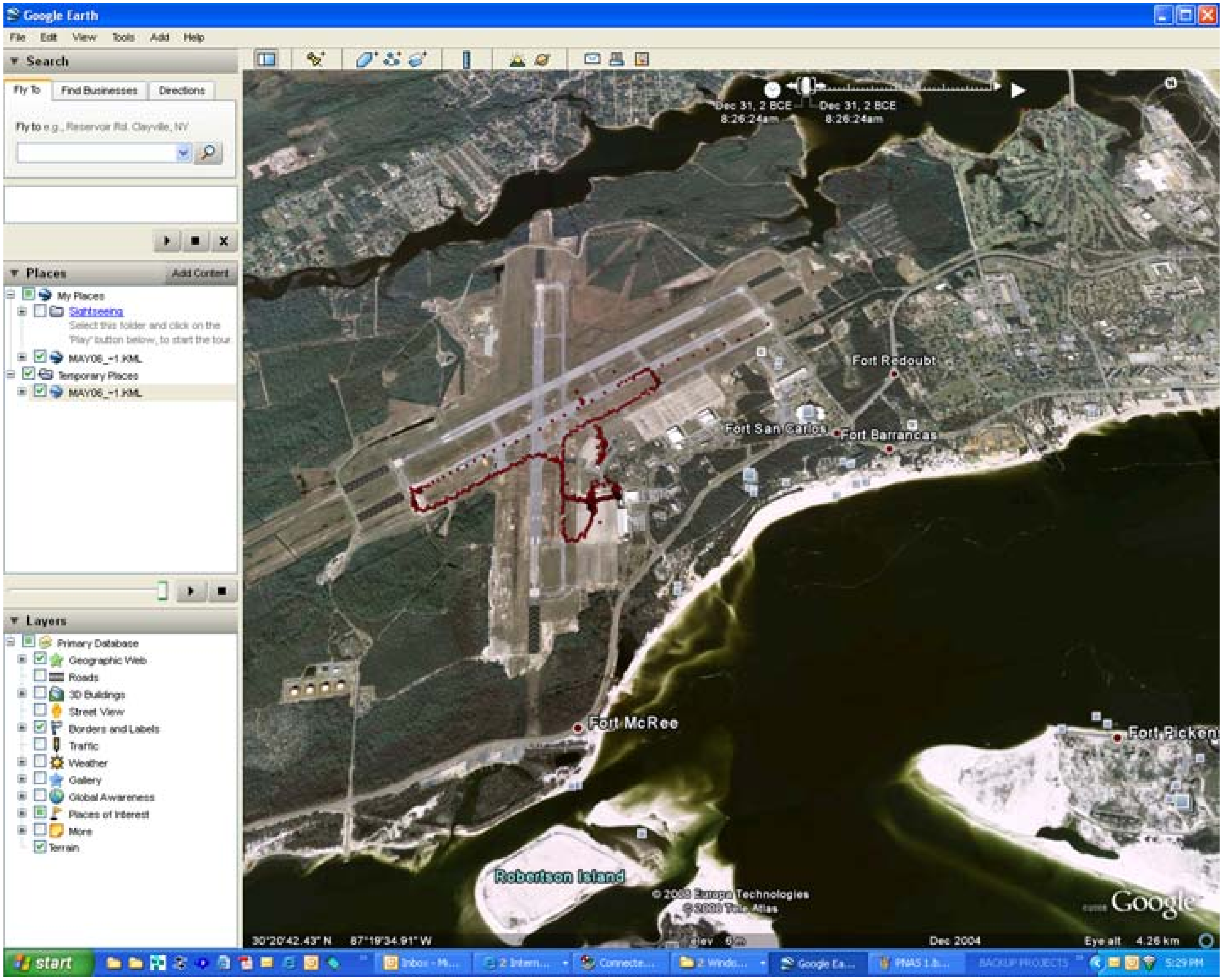
Target System Testing on Gulf Coast



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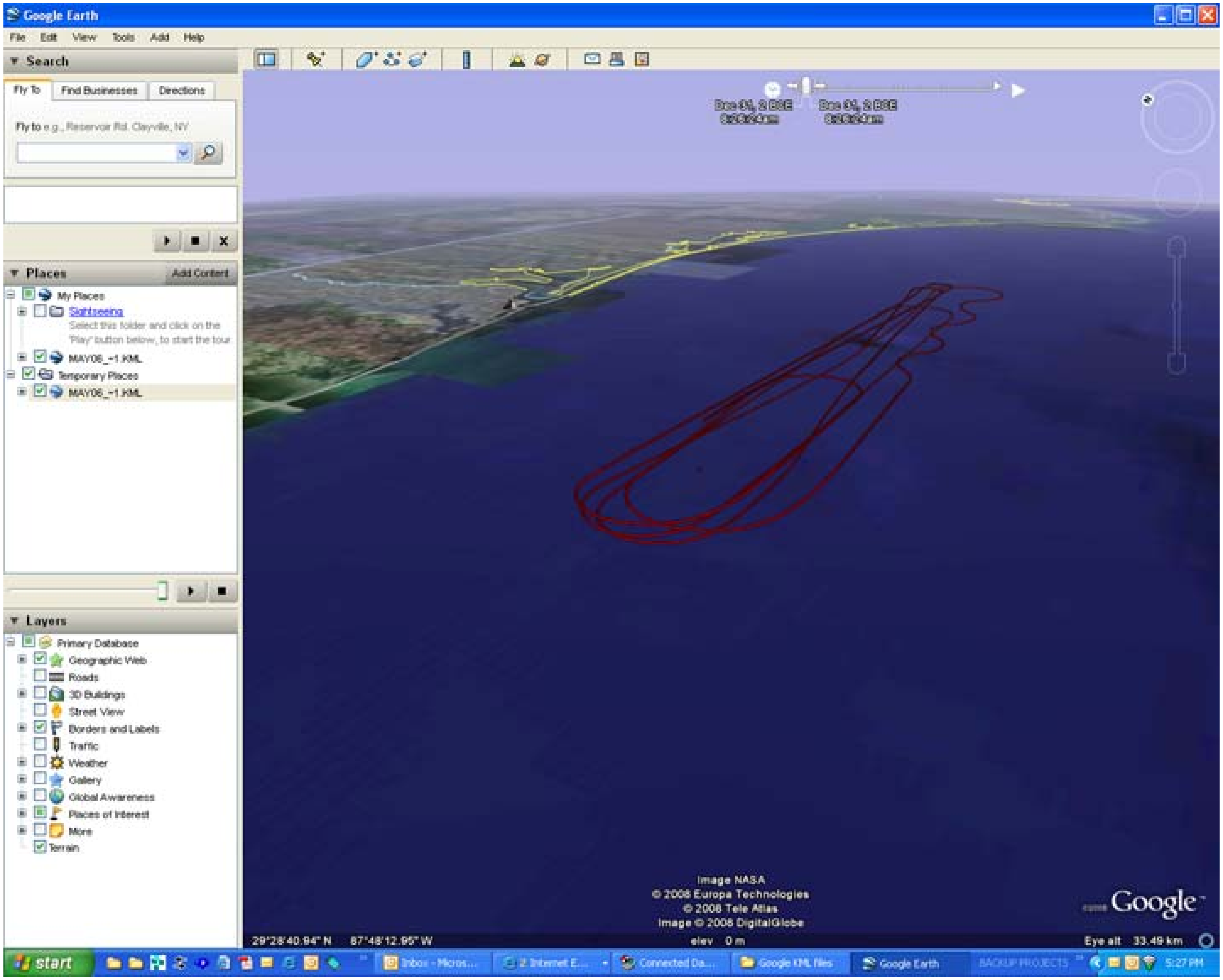
Target System Testing on Gulf Coast (Concluded)



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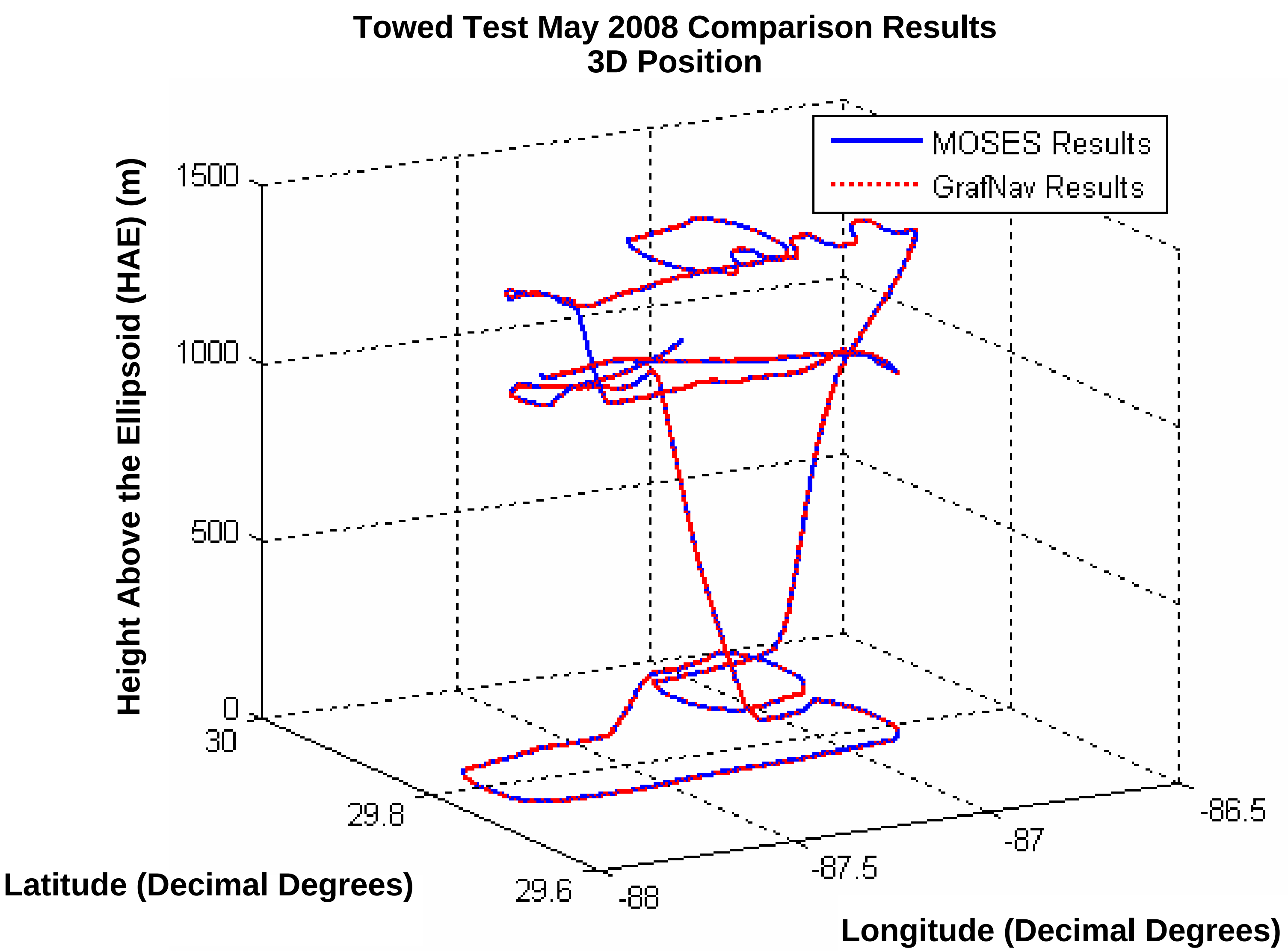
GPS Position Results



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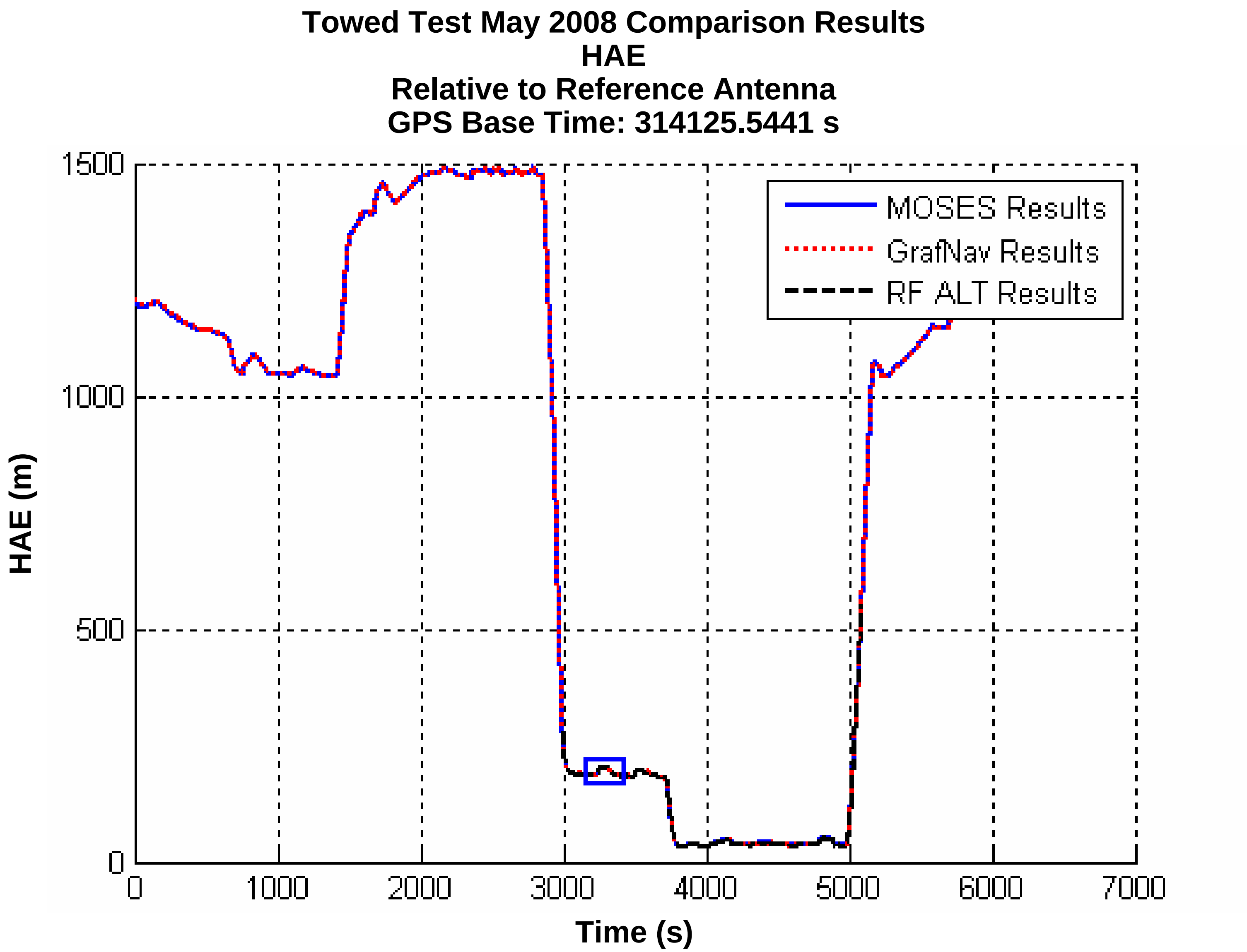
GPS Position Results Versus Radio Frequency (RF) Altimeter (Navigation Mode)



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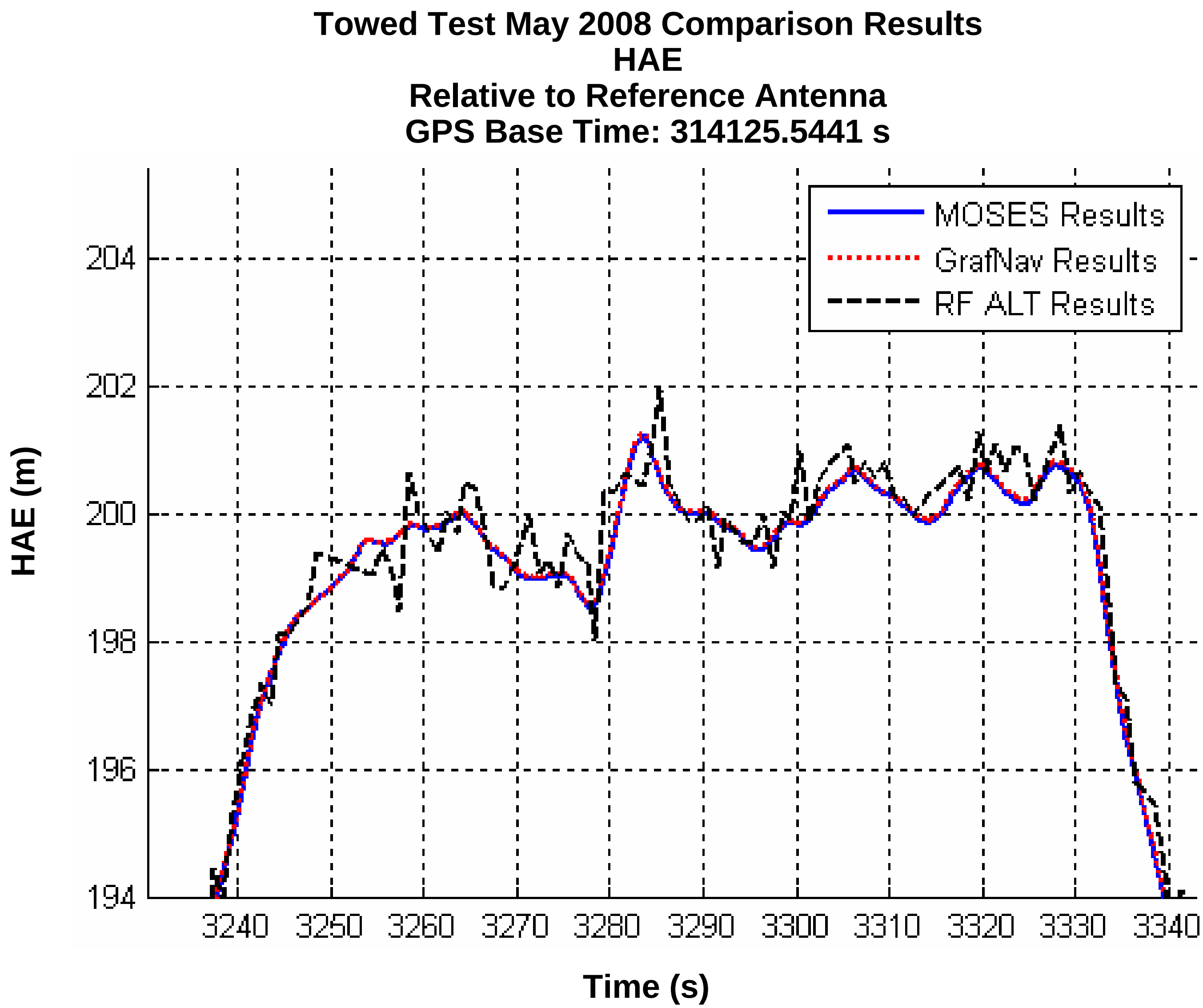
GPS Position Results Versus Radio Frequency (RF) Altimeter (Navigation Mode) (Concluded)



GPS Summary | **Heading** | **Altitude** | **Velocity** | **GPS Time** | **Satellite Constellation** | **Satellite Signal to Noise**

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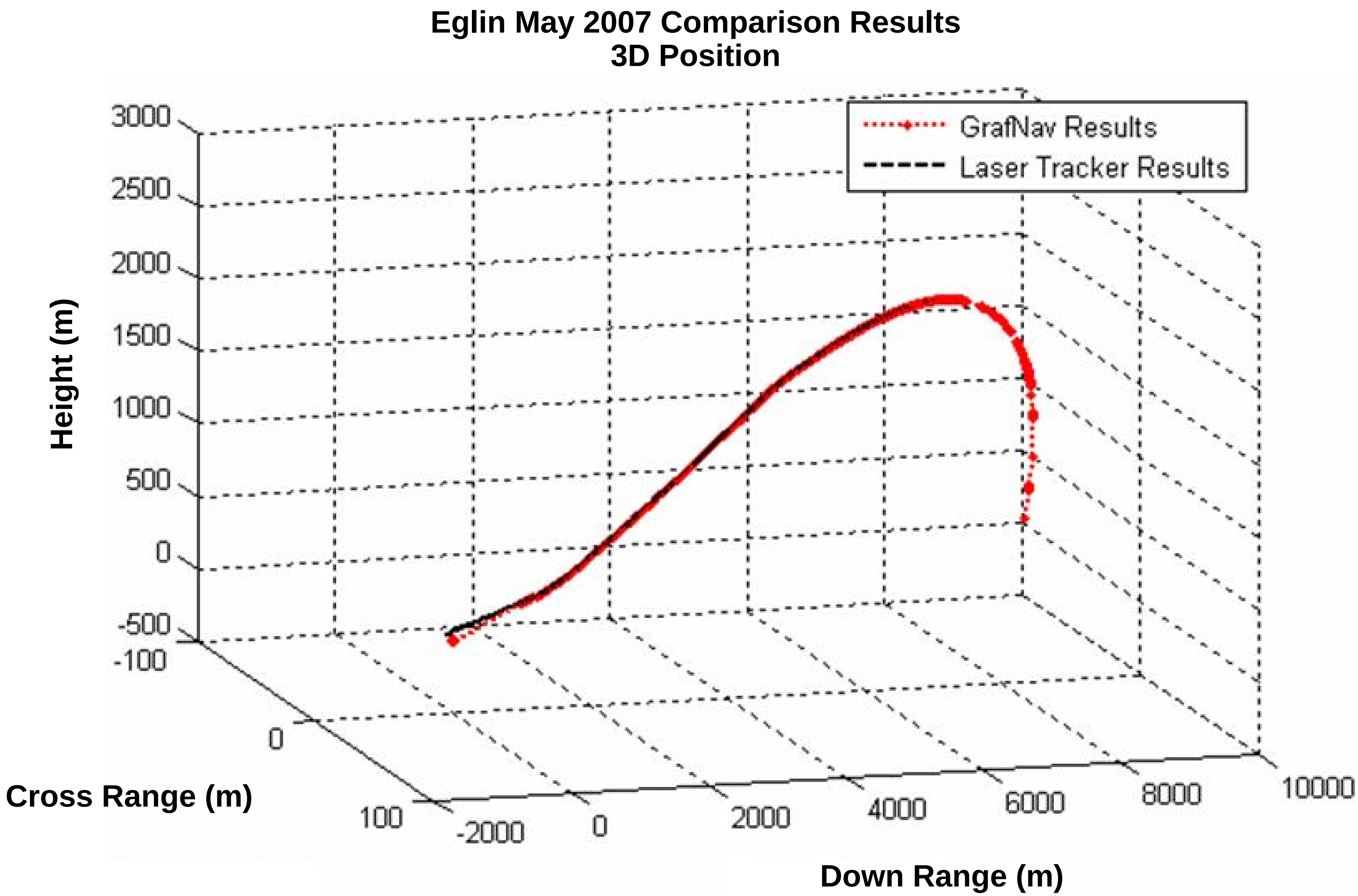
GPS Position Results Versus Laser Tracker Results (Sensor Mode)



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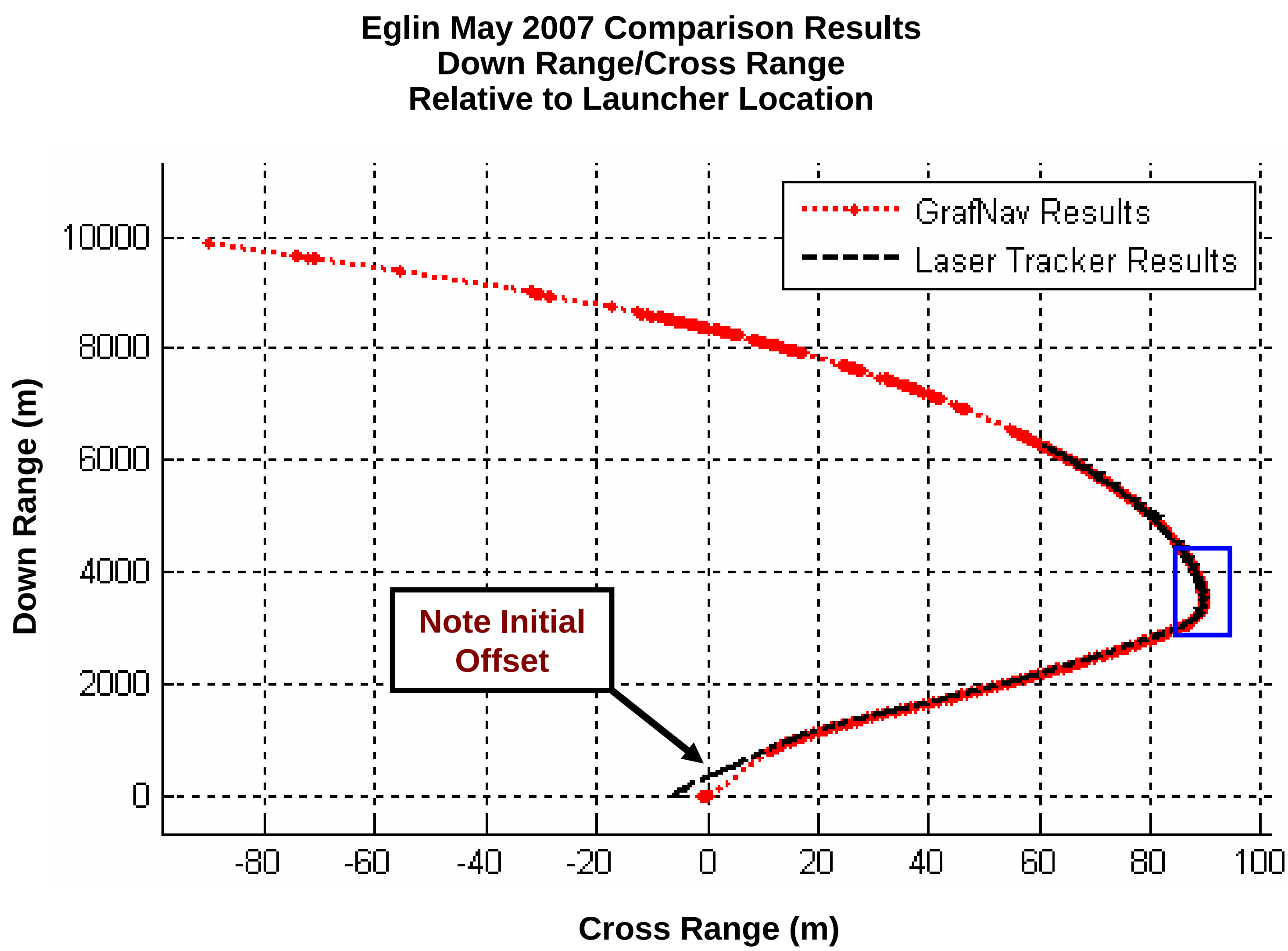
GPS Position Results Versus Laser Tracker Results (Sensor Mode) (Continued)



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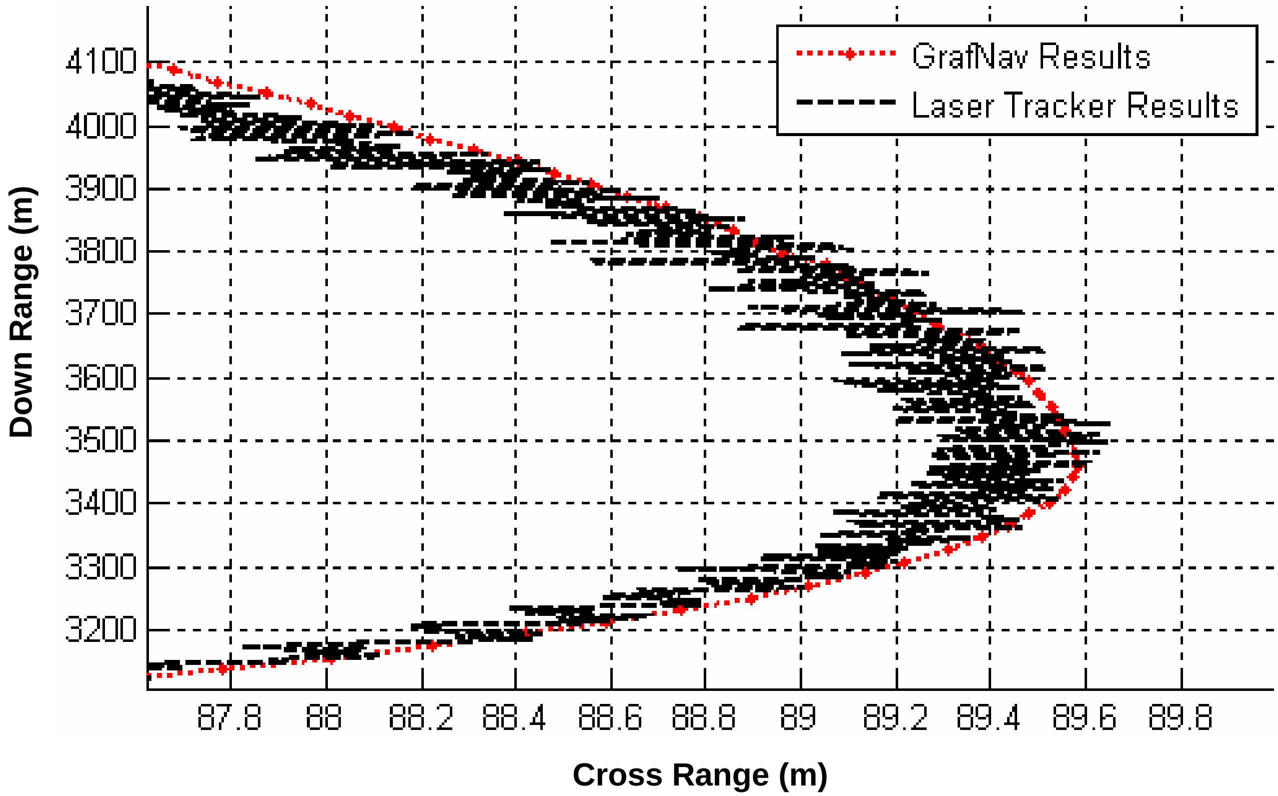
GPS Position Results Versus Laser Tracker Results (Sensor Mode) (Continued)

- **For This View:**
  - **Cross-Range Difference > 0.4 m During the Maneuver**
  - **Down-Range Difference = ~1.4 m (Not Easily Seen in This Graph)**



- **For the Entire Data Set:**
  - **Cross-Range Difference: Mean = -0.16 m**
  - **Down-Range Difference: Mean = -0.92 m**

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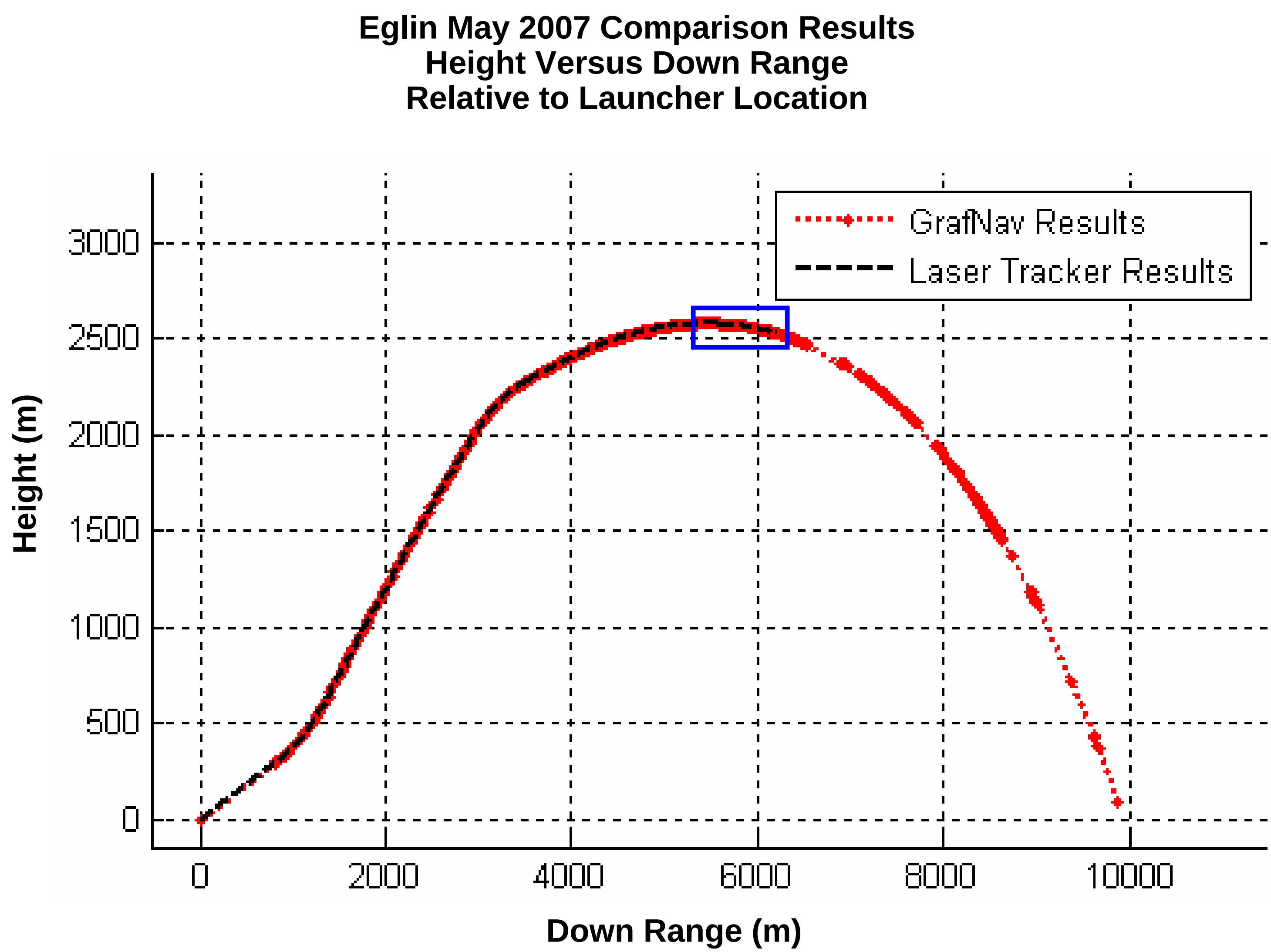
GPS Position Results Versus Laser Tracker Results (Sensor Mode) (Continued)



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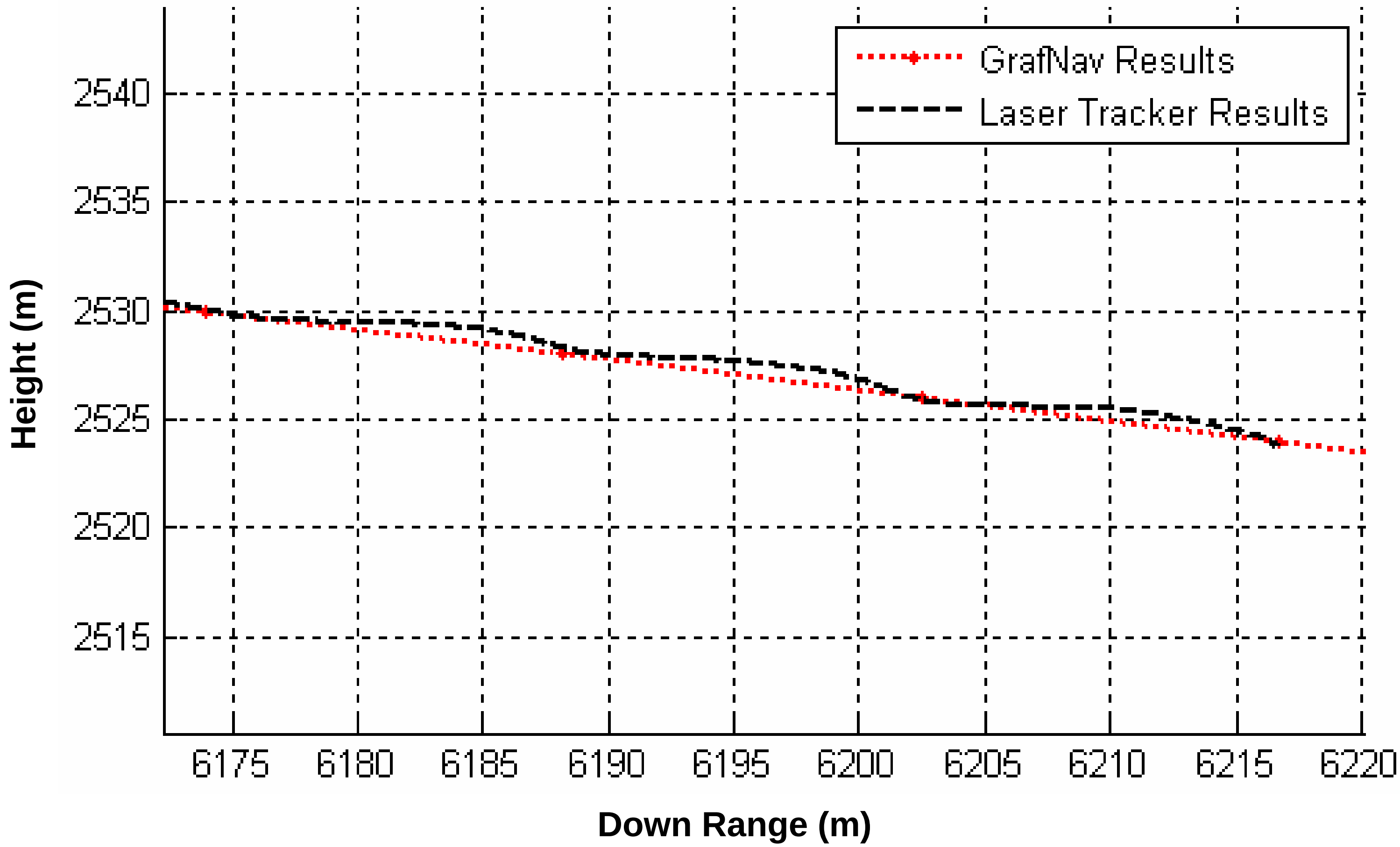
GPS Position Results Versus Laser Tracker Results (Sensor Mode) (Concluded)



- **For the Entire Data Set:**
  - **Down-Range Difference: Mean = -0.92 m**
  - **Height Difference: Mean = -1.0947 m**

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Benefits for Using GPS Over Laser Tracker

- Operates in Adverse Weather Conditions (e.g., Fog and Rain)
- Only Dependent on the Satellite Coverage, Which Is Fairly Reliable
  - Requires at Least Six Satellites for Carrier-Phase Processing
  - Satellite Coverage Is Predicable; Therefore, Test Scheduling Can Be Determined in Advance
- Technology Is Capable of Regaining Track After Loss
  - Has Been Demonstrated in Results
- Tracking Range Only Limited by RF Link Capabilities of the Telemetry Stream
- Relatively Inexpensive Ground Station Equipment
  - Makes Having Redundant Equipment Possible, Which Allows for More Reliable Data Collection or Support for Multiple Test Locations if Required
- Minimal Additional Personnel to Support Collection
  - Telemetry Team and Equipment Already There to Support Test
  - One Person Can Perform GPS Responsibilities for Mission and Post-Mission Tasks

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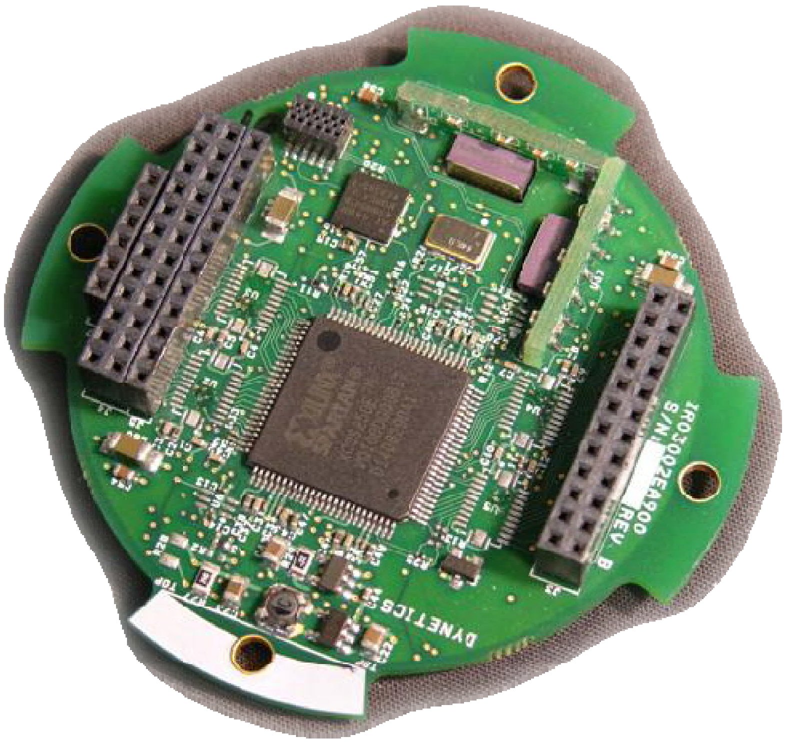
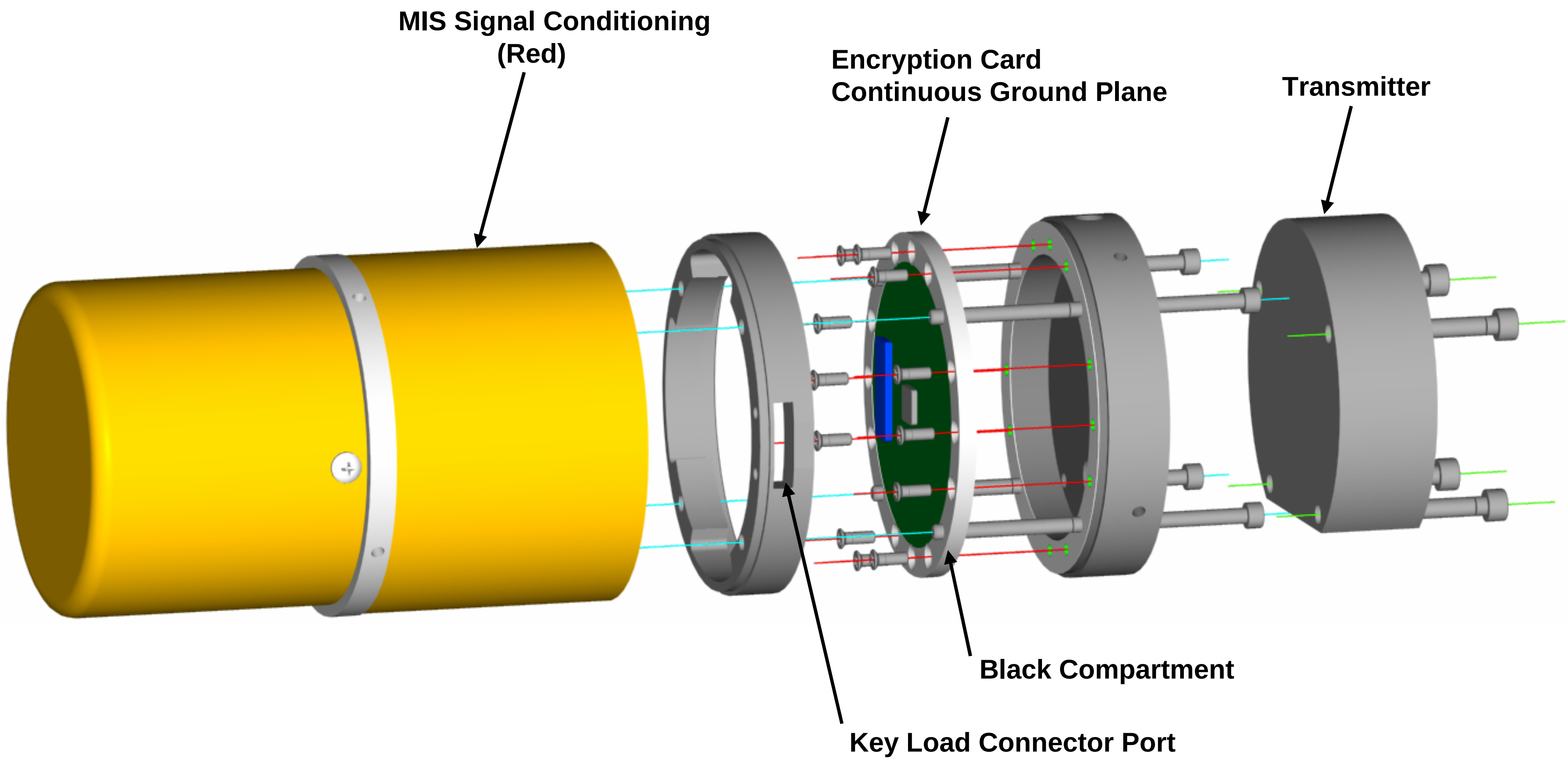
IMU Module



- **Linear Acceleration**
  - **3-Axis**
  - **Lateral Accelerations (Dual Range)**
    - **±35 and ±50 g**
  - **Axial Accelerations (Dual Range)**
    - **±10, ±25, ±50, and ±100 g**
- **Roll Rate to 20,000 deg/s**
- **Angular Rate Sensor**
  - **3-Axis**
  - **±300-deg/s Range**
- **Magneto-Resistive Sensor**
  - **3-Axis**
  - **±6 Gauss**
- **Signal Processing**
  - **CPLD – Address Decoding**
  - **A/D Converter – 12 Bit**

Encryption Capability



MIS With Encryption

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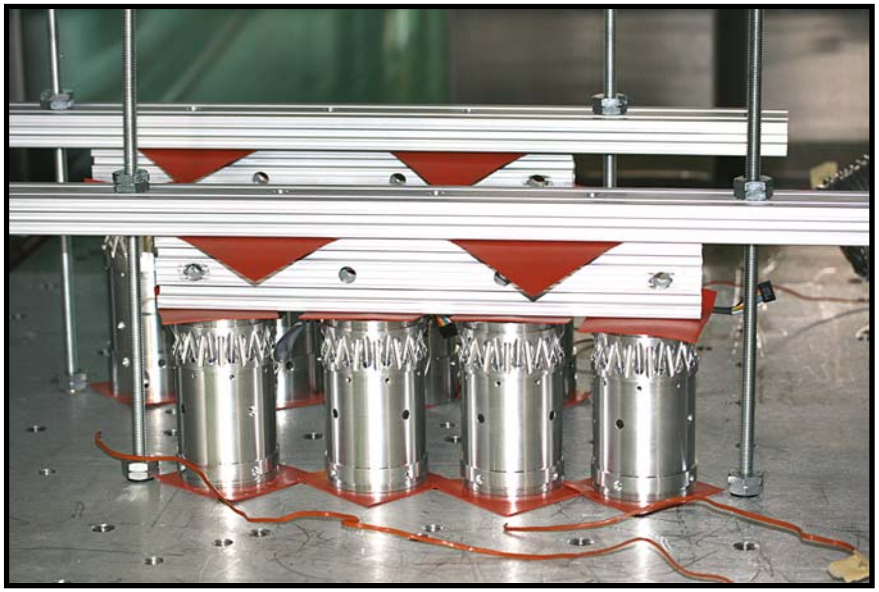
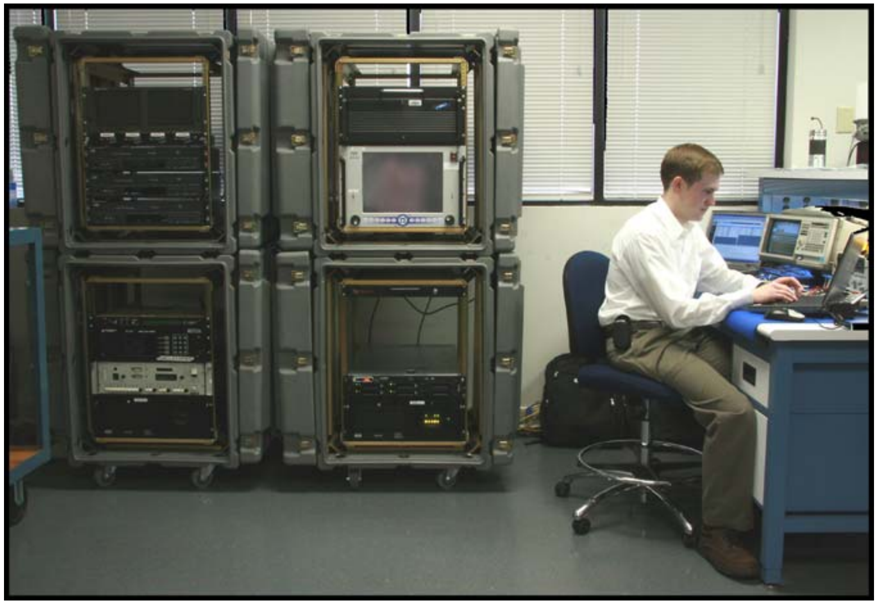
Telemetry Fabrication, Calibration, and Test





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Telemetry and Instrumentation Ground Receiver Station (TIGRS) Van

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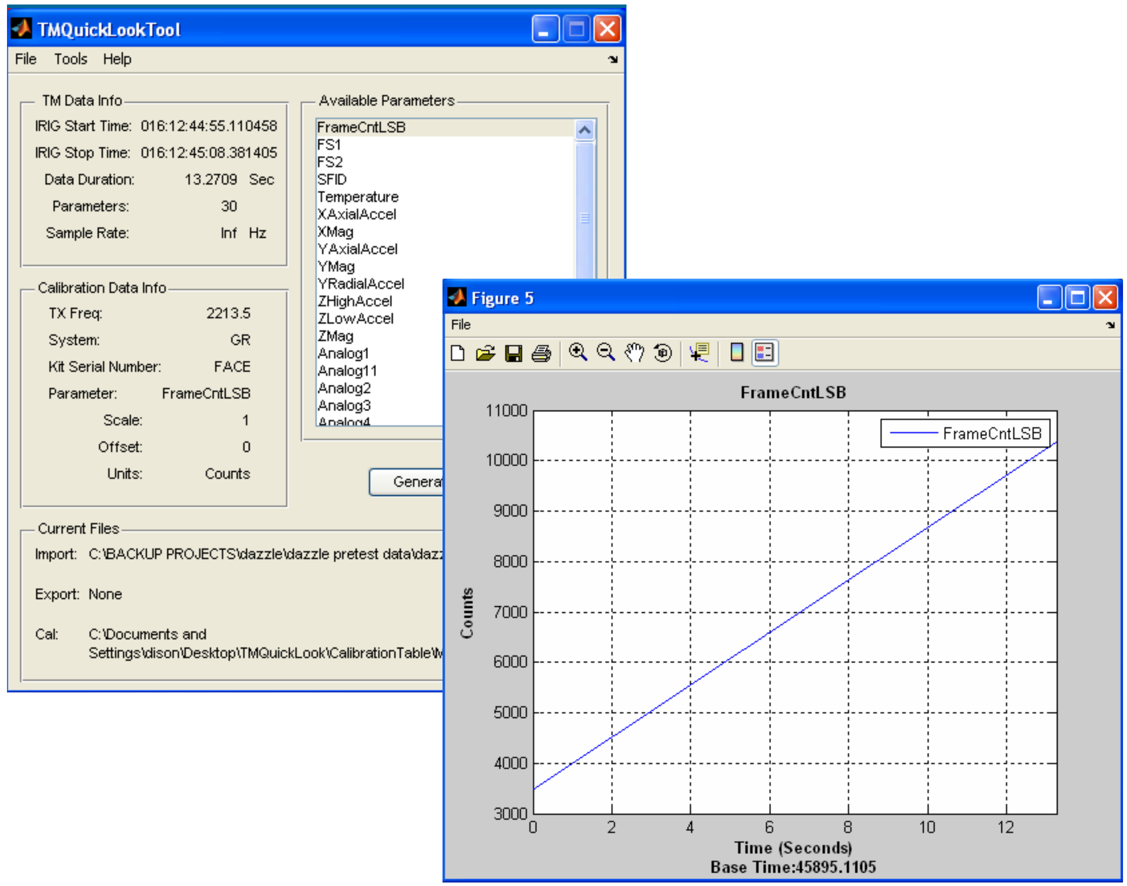
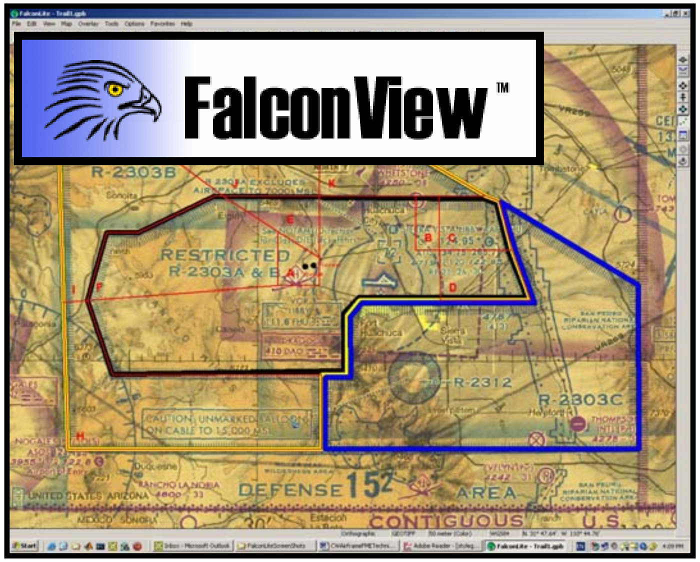
Post-Test Data Viewer

Real-Time and Post-Mission Performance Monitoring Is Critical for System Evaluation

- **Matlab-Based Rapid Data Display**
- **Multiple Channels**
- **Optional TENA Compliant Real-Time Networked Data Display**



UAV Instrumentation: OATIS

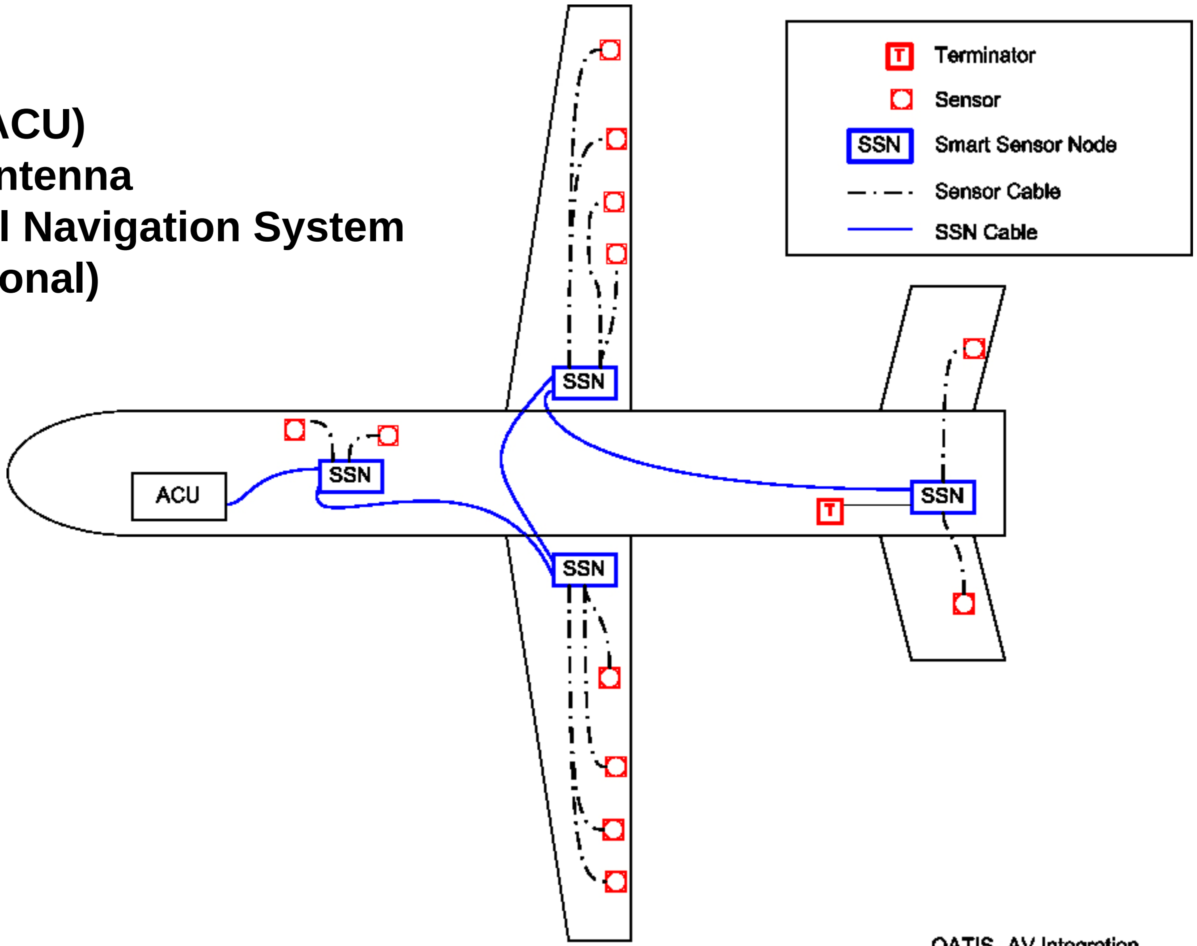


OATIS

- OATIS Is a Modular System Designed to Make, Log, and Transmit Inertial and Various Other Measurements to a Ground Station

- Airborne Payload
  - Airborne Control Unit (ACU)
  - RF Modem and Blade Antenna
  - C-MIGITS III GPS/Inertial Navigation System (INS) and Antenna (Optional)
  - Smart Sensor Nodes

- Ground Station
  - Ground Station Server
  - Control Panel
  - Moving Map Display
  - Strip Charts

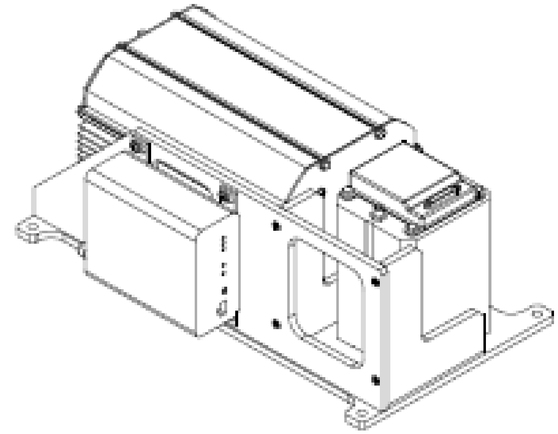


OATIS$_2$ AV Integration Overview
5jan2005 mpw

OATIS: Airborne Components

C-MIGITS III GPS/INS

ACU



Equipment Tray

Microhard Modem

Smart Sensor Nodes

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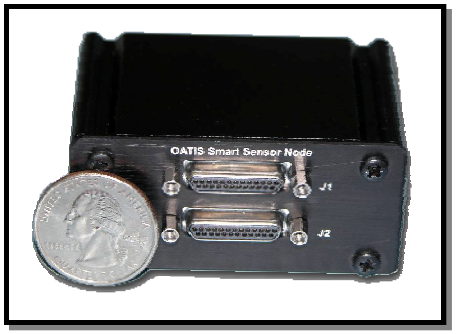
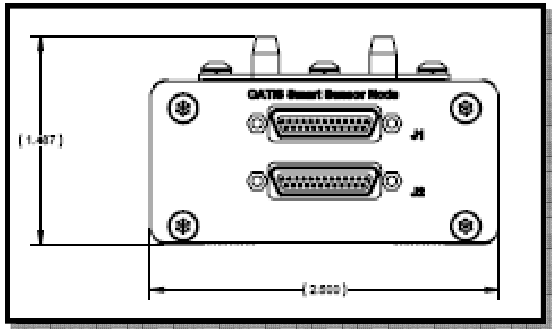
Smart Sensor Node Family of Products

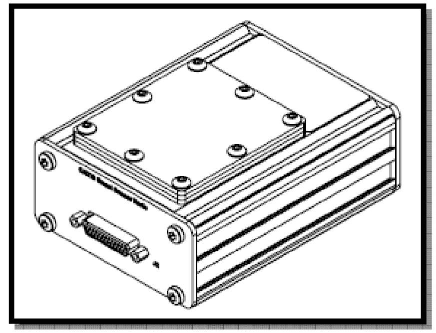
Nodes



Standard Node (-10)



Air Pressure Node (-50)



Thermocouple Node (-60)

Sensors

Measurement Type	Examples	Sensor Type	Typical Rate (Hz)
Air Pressure	Air Speed, Altitude	Pressure Transducers (Absolute and Differential)	20
Temperature	Ambient Temperature, OAT	Thermister	5
Temperature	Engine Exhaust, Engine Block	Thermocouple	5
Flow Rate	Fuel Flow	Flow Meter	20
Position	Throttle Position, Control Surface Deflection	String-Potentiometer	100
Acceleration	Vibration	Accelerometer	1000
Pulse Frequency	RPM Pickup From Spark Plug	(Built-in)	10

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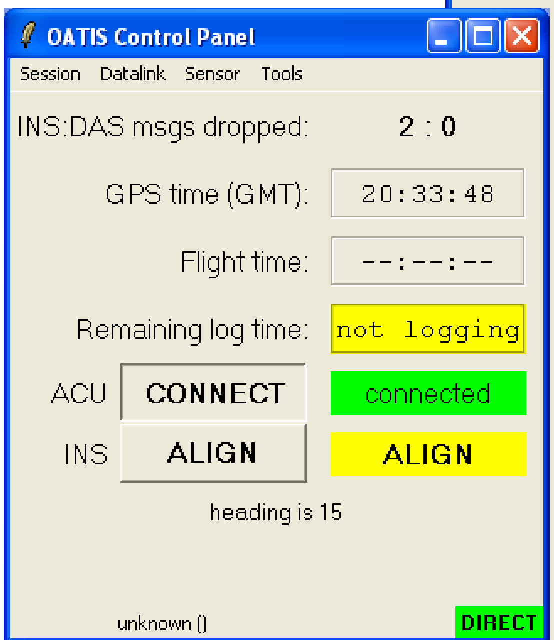
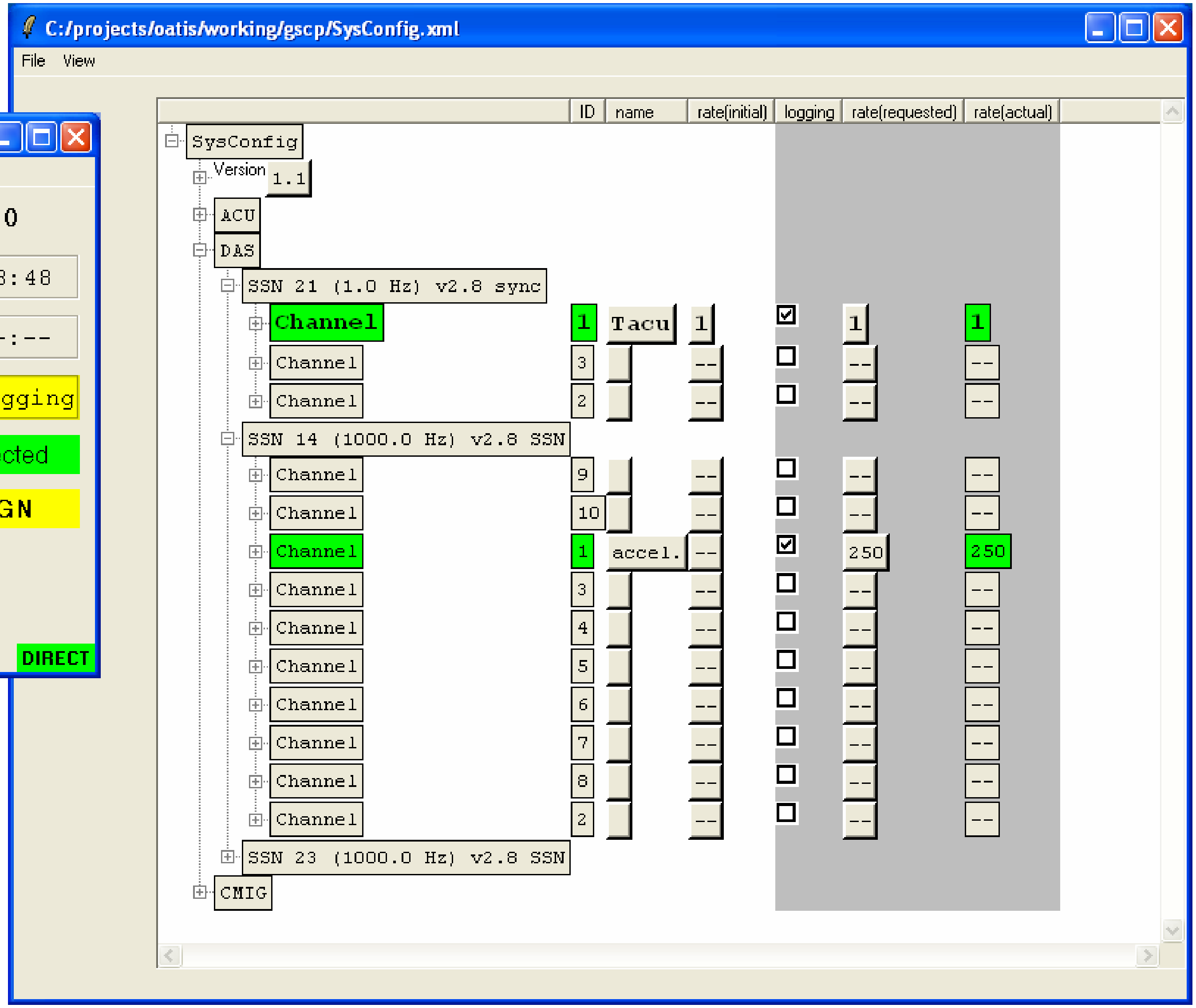
OATIS: Ground Station Software

Control Panel

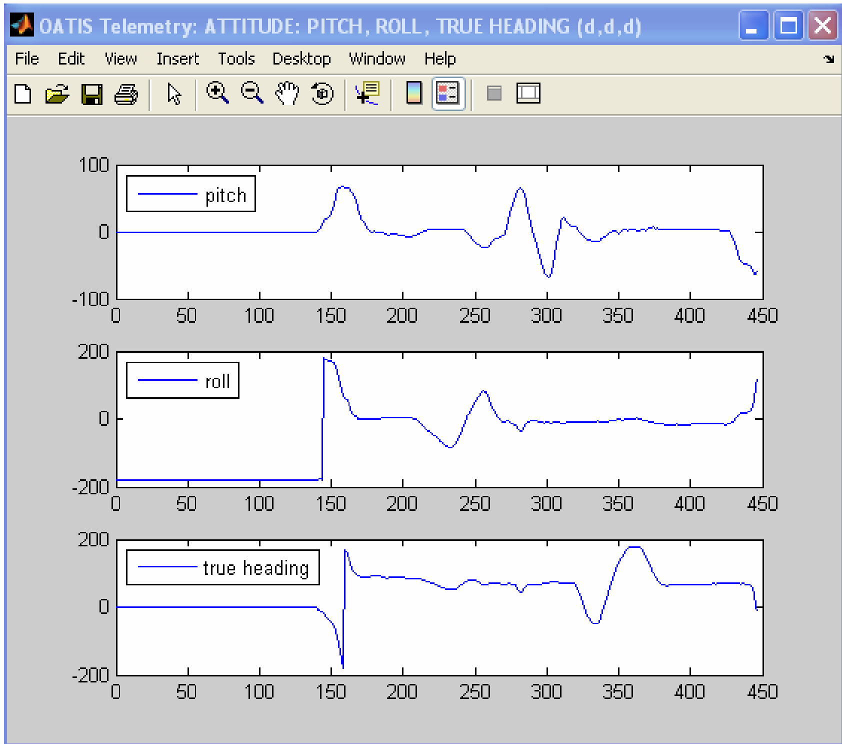




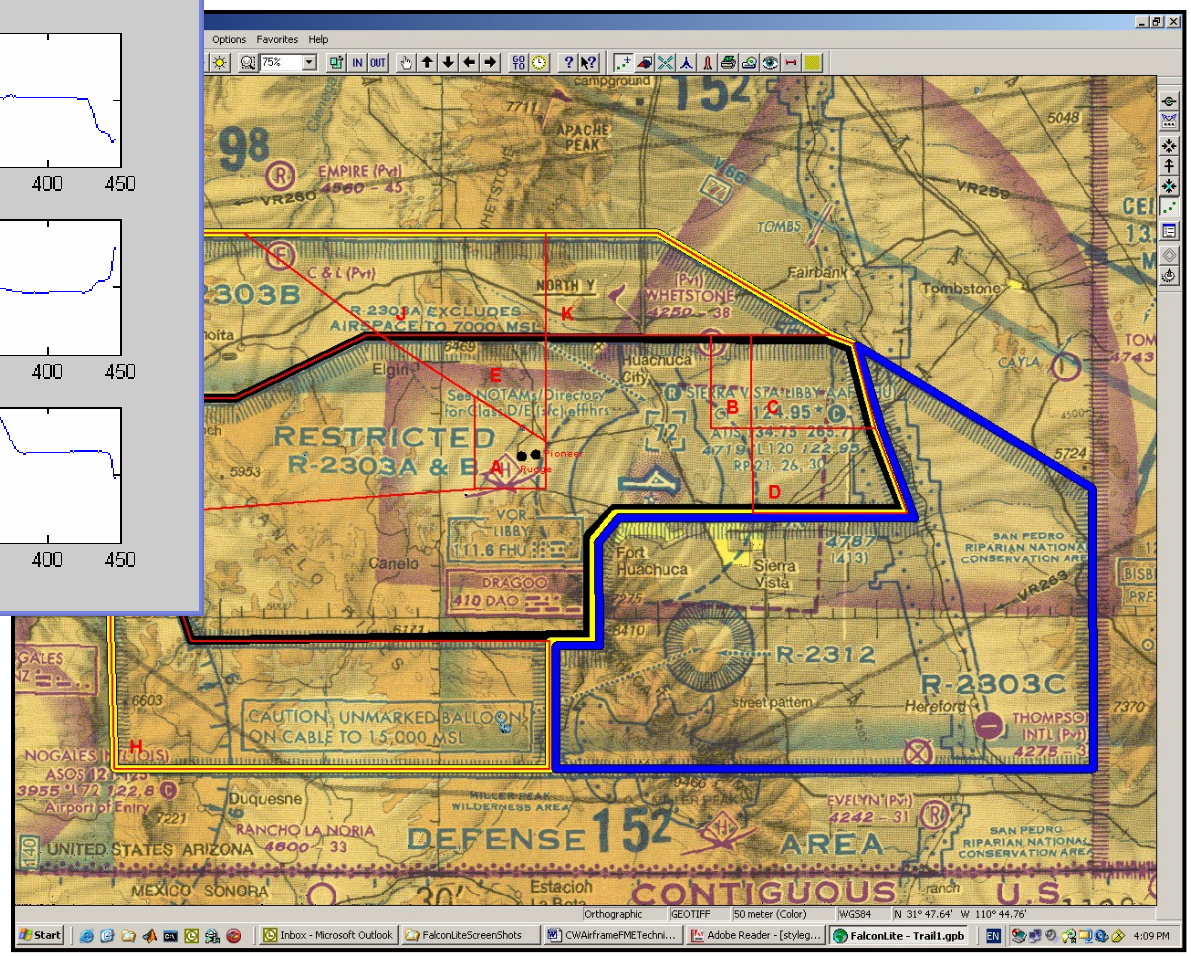
Configuration Editor

OATIS: Situational Awareness

Real-Time Strip Charts



Real-Time Moving Map Display (FalconView)



Complete OATIS System Installed

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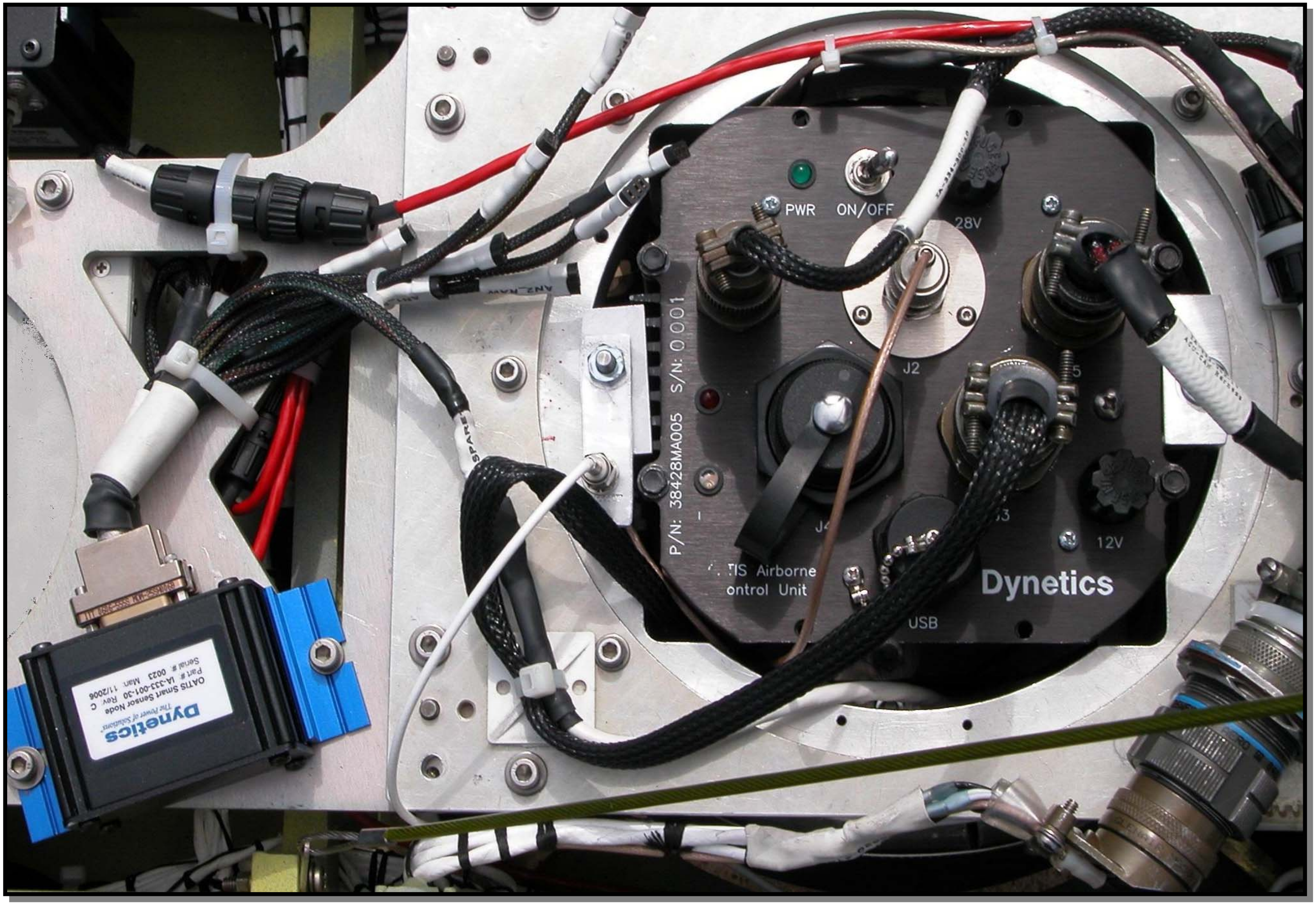
OATIS Installed



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Comparison of MIS and OATIS Systems

Parameter	MIS System	OATIS System
Size	2.5” Diameter x 3” Length	8” Length x 7” Diameter
Weight	< 1lb	5 lbs
Downlink Data Rates	10 Mbits/s	115 kbits/s
Downlink Protocol	IRIG 106, 1-Way	Commercial, 2-Way
Range	2 to 50 km	100 km, Omnidirectional
Encryption Type	Tactical	Commercial
Onboard Memory	8 GB/Board	4 to 32 GB
Operational Environments	High G	Flight Tests
Typical Applications	Missiles, Targets, and Sled Testing	UAVs and Manned Aircraft

Future System Enhancements

- MIS System
  - MIL-STD-1553 Interface Card Development
  - Enhanced Encoder Card Development
  - Graphical User Interface (GUI) Development
  - Qualification Testing of Encryption Module
  - Expanded Analog Conditioning Module

- OATIS System
  - Enhanced Signal Conditioning Capability
  - Onboard FFT Capability
  - Reduced System Size and Weight

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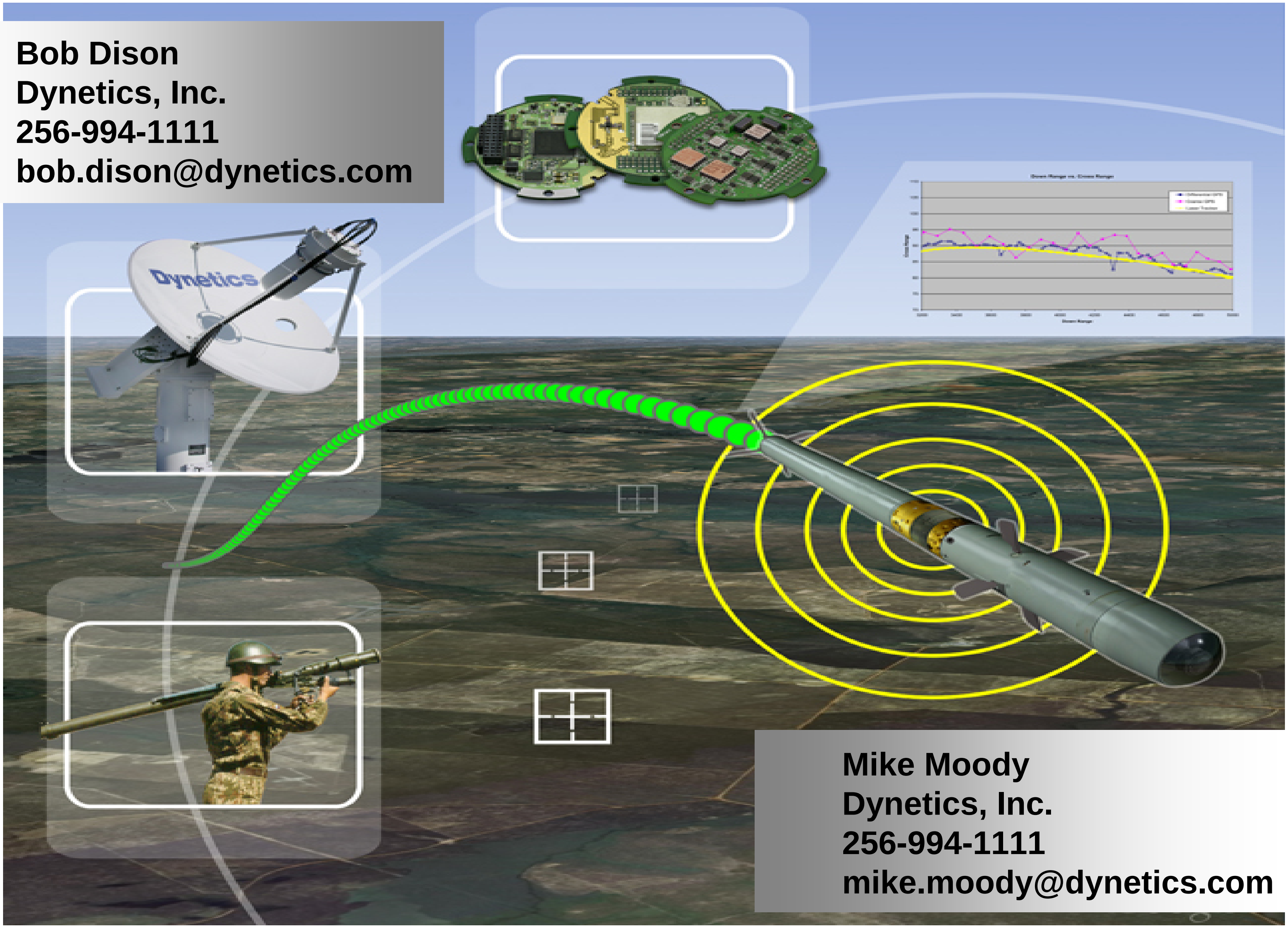
Summary

- **Dynetics Has a Long History of Supporting Flight Tests for Weapons, Targets, and UAVs**
  - **Over 50 Missile Shots on 10 Different Platforms With Latest MIS System**
  - **Over 70 MIS Systems Planned for Delivery During the Next Year**
  - **Over 450 hrs of Flight Testing on 4 Different Platforms With OATIS**
- **From This Experience, We Have Developed Two Distinct Telemetry Systems**
  - **OATIS for Applications Where Space and Weight Can Be Traded Off for Flexibility**
  - **MIS for Applications Where Space, Range Standards, and Data Rates Are the Driving Factors**
- **New Applications May Be Addressed by Either OATIS, MIS, or a Hybrid Mix**
- **Dynetics Has Significantly Invested in Redundant Ground Collection Equipment and Offers These Services for Flight Tests**

Points of Contact for MIS



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